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DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

Neglected Opportunities

"IN order to allow the time which may be necessary to handle the traffic punctually on some 15 working days in the year when it is exceptionally heavy, the public is penalised on the other 255 days, and lines are occupied unnecessarily—apparently simply to save timetable alteration." So writes a correspondent in a letter analysing the train services on a section of a certain British railway over which he has been travelling observantly during the last few weeks. It is a section to which modern locomotive power has recently been drafted, with the result that, the timetables not having been altered to take advantage of the capacity of the new locomotives, the trains have to wait an inordinately long time at stations in order not to leave before schedule. This is a state of affairs which not only displeases travellers who do not enjoy waiting in quiet contemplation of the still life of railway stations, but is wasteful of time and energy. Further, it deprives the public of the benefits which it should enjoy as a result of the advances in railway engineering, and, perhaps what is as serious as anything, it tends to lower the morale of the railway staff. Unfortunately the particular railway referred to by our correspondent is typical of sections of every one of our main line railways today.

The Railway Mania

There has probably never been a more extraordinary period in British railway history than that of the great railway mania of 1846. In that year no fewer than 272 Acts authorising new railways were passed by Parliament, and although this enthusiasm for railway shares was accounted for in part by the successful results achieved by such pioneers as the Liverpool & Manchester Railway, it was due mainly to the fact that 90 years ago there were no limited liability companies, and industrial enterprises incorporated by Parliament provided the chief medium for share speculation. The tremendous depression which followed the railway mania produced a spate of pamphlets and this week we devote our Scrap Heap page to the reproduction of Part I of a scarce and interesting publication of that period which has recently come into our possession, and which was doubtless inspired by the dubious methods employed by certain railway promoters of the 'forties. Incidentally, the sequel to the railway mania was recorded by a Mr. Arthur Smith in 1848 in another pamphlet, entitled "The Bubble of the Age." In this he said "all the shares of the railway companies sanctioned in 1845 now sell for less—with £25, £30, and £40 paid up—than in 1845, with £1, £2, or £3 paid up; and scrip was depreciated £60,000,000 between September, 1845, and April, 1846; and the aggregate depreciation in the value of the shares of all the English railways exceeds the enormous sum of two hundred millions sterling—being one fourth of the National Debt!"

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The Week's Traffics

Traffic returns of the four group companies for the past week include the Whitsuntide Bank Holiday receipts, and compare with a week in 1935 which comprised the long-distance Whitsuntide bookings. Hence passenger train earnings are down, and the loss of a working day has reduced the merchandise and coal receipts. Comparing the traffics for the complete Whitsuntide holiday periods in the two years it will be found that on the passenger side there were the following increases in 1936:—L.M.S.R. £22,000, G.W.R. £10,000, and Southern £16,000, with no change on the L.N.E.R. Merchandise gave increases of £43,000 on the L.M.S.R., of £15,000 on the L.N.E.R., of £16,000 on the G.W.R., and of £9,500 on the Southern.

	23rd Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R.	— 67,000	— 63,000	— 74,000	— 204,000	+ 752,000	+ 2·94
L.N.E.R.	— 12,000	— 33,000	— 53,000	— 98,000	+ 467,000	+ 2·49
G.W.R.	— 32,000	— 33,000	— 39,000	— 104,000	+ 188,000	+ 1·79
S.R.	— 51,000	— 7,500	— 4,500	— 63,000	+ 92,000	+ 1·13

In coal the decreases were L.M.S.R. £5,000, L.N.E.R. £2,000, and G.W.R. £7,000, but the Southern had an increase of £1,500.

* * * *

The New Indian Constitution and the Railways

Sir Otto Niemeyer's report upon Indian finances, published last month, contains much that concerns the railways of that country. Primarily, it stresses the fact that the entire financial structure of the new Constitution is indirectly dependent upon the ability of the Railway Budget to meet any future deficit from its own reserves, without assistance from the general finances of the Government of India. Furthermore it brings home to the Provinces the unpalatable fact that the annual contributions from the Central Government—on which they are counting for the success of the reforms—are likely to materialise only if they reverse their present short-sighted policy of encouraging uncontrolled road competition at the

expense of the railways. For it is obvious that continued losses of traffic to the roads on the present scale will prejudice railway contributions to the Central Exchequer, and, should those losses increase materially, they may even cause a reversal of the flow of funds to instead of from the railways: in either case contributions from the Central Government to the Provinces will be curtailed. The Provincial Governments have it in their power to place road competition on a fair basis, and, in the circumstances, it will undoubtedly be in their own interests as well as in the interests of the long-suffering railways to do so.

* * * *

The Improvement of Indian Railway Finances

In his concern for the future success of the reforms in the Provinces, Sir Otto casts about him for means of ensuring that the railways shall not only show no deficit, but shall also contribute materially through the Central Government to the Provinces. He therefore recommends extensive operating retrenchments, but no increase in rates or fares. In this connection it should be remembered that recent retrenchment already exceeds Rs. 6 crores (£4½ millions) annually, secured largely by action taken upon the Pope Committee's recommendations and by general economies, and further savings on a large scale would entail another serious reduction of staff, a last resort to be deplored from the human standpoint in these hard times, and also because it may easily result in decreased efficiency, thus creating a vicious circle. On the other hand, the railways might reasonably expect some form of compensation from the Army Department for the Rs. 2 crores (£1½ millions) they lose annually on the working of strategic lines, and also for concessions on military transport totalling about half that sum. It is, moreover, authoritatively stated that the Railways Depreciation Fund might safely be reduced by 20 per cent. If the Railway Budget could be relieved by reduction of road competition and in the three other ways just indicated, deficits should, we think, cease at once, and contributions to assist the Provinces, such as Sir Otto desires, should also be forthcoming at an early date. This view is strengthened by the fact that final railway figures for the year ended March 31 proved better than anticipated, and revenues during the current year are already Rs. 25 lakhs (or nearly £200,000) better than at this time last year.

* * * *

A Transport Salesman's Encyclopædia

The number of services offered by the railways has grown to an extent which makes it desirable for those whose business it is to sell them to the public to be provided with a summary and reminder of their scope. Such a publication, dealing with passenger transport, has been issued by the L.N.E.R. to stationmasters, passenger agents, and others, and is on similar lines to a booklet published by the company in January this year for the goods traffic staff. It consists of reproductions of the posters and handbooks whereby the facilities are brought direct to the notice of the public, but with the addition of notes on " selling points " which may be emphasised in conversation with prospective travellers. In a foreword, Mr. C. Dandridge, the Advertising Manager, reminds users of the book that the considerable expenditure on poster and similar advertising is justified only if it is backed up by the enthusiastic co-operation of the staff. Nothing, of course, is more trying for a traveller than to find after he has made a journey that he might have done so on more favourable terms, and the present booklet will minimise the chance of this happening through lack of information at stations and offices.

A Touch of Hollywood

We recently heard it remarked of an employee at a certain London suburban station that he was " more like a film star than a porter." The words seemed to be spoken less in criticism of porters in general for not conforming to Hollywood standards, than in surprise at finding among them one who might discharge with honour the function referred to. A punter who complains that his fancy would have deserved his confidence better in a race for mechanical horses than in one for three-year-olds is recognised to be blaming the animal for trying to fill a part for which it was not intended by Nature; similarly, we think, the comment we quote was uttered as much in censure of a potential film star for remaining a porter as in gratification at observing a porter who could take his place with credit among the film stars. The low estimate implied of the degree of personal attraction which it is proper for a porter to possess was doubtless influenced by the setting in which these men have hitherto been seen at work. As station repainting provides them with a more colourful *décor*, manifestations of their latent glamour will perhaps be greeted with less suspicion.

* * * *

Holiday Traffic Working

Unpunctuality at busy week-ends, such as Easter and Whitsun, has been so general in the past, and so often considered quite unavoidable, that the successful working of a difficult group of trains on the L.M.S.R. is worthy of note. At such times three out of the four fast and heavy expresses leaving Euston about 6 p.m. are invariably duplicated. In past years these trains had been despatched at about 3-min. intervals, and the small headway made delays inevitable even if all departures were to time. Deliberate easy running to avoid checks resulted in the fourth or fifth train of the series being anything up to half an hour late before it was 100 miles out of London. But beginning in 1934, the second parts of the 6.5 and 6.10 p.m. expresses were despatched at 6.15 and 6.20 p.m. respectively, thus leaving the first portions in their normal paths; a relief to the 6.0 p.m. was run at 5.55 p.m. thus giving a regular interval of 5 minutes between 7 successive trains, 6 of which are non-stop to Crewe or beyond. The result of this careful planning, aided by keen and intelligent work by the engine crews, has been almost exact timekeeping at each holiday.

* * * *

Strict Punctuality

This year, on the Friday before Whitsun, there was rather an unpropitious start to the practice described in the preceding note, for the 5.55, 6.0, and 6.5 p.m. trains all got away slightly behind time and somewhat bunched together. The 6.5 p.m., by which we travelled, was delayed by signal at Hatch End, and for some miles thereafter was running very close in the wake of the 6 p.m. Beyond Boxmoor, however, the preceding trains had drawn sufficiently ahead to give a really clear road, so clear in fact that the 6.5 was able to run the 48·6 miles from Tring to Hillmorton box at an average speed of 69·3 m.p.h., and to pass Rugby on time despite the earlier signal checks and the late start. This feat, which was achieved with a gross load of 510 tons, involved a first rate locomotive effort by engine No. 6111 of the " Royal Scot " class, but, it need hardly be mentioned, also showed equally good work by the three trains just ahead. Notable, too, was the fact that the Merseyside Express obtained a perfectly clear road through such busy centres as Rugby, Stafford and Crewe, and, with normal locomotive work north of Rugby, the train reached Liverpool on time, calling forth appreciative remarks from many passengers.

A Good L.N.E.R. Record

The foregoing notes, it is to be confessed, owe their inspiration partly to the joy with which the sinner that repenteth is welcomed, but we must not forget those who have been perhaps less reprehensible in the past, and a word of commendation on the punctuality observable during the recent holiday season on the L.N.E.R. is also due. Typical of the sort of enterprise displayed by the Locomotive and Traffic Departments was the run of a special up Leeds express on Bank Holiday which, hauled by one of those marvellously capable Ivatt Atlantics and weighing no less than 450 tons, arrived at King's Cross only five minutes late in spite of the dense occupation of the line, which had involved signal delays amounting altogether to 12 minutes. In addition there had been permanent way slacks which had cost another three minutes. The desire to effect a punctual arrival at King's Cross induced the authorities to double-head this heavy train up from Peterborough, and but for a signal delay and a permanent way slack between Potter's Bar and London the aim would have been achieved. Before the second engine was taken on at Peterborough, the one engine had brought the heavy train to that city, 29 miles from the Grantham start, including the climb over Stoke summit, in 34 minutes.

* * * *

The Corrosion Problem in Steel

There is a paper by Dr. A. McCance on " The Corrosion Problem in Steel " in the April issue of the " Transactions of the Institution of Engineers and Shipbuilders in Scotland," in which the author has drawn freely from the numerous works published by many investigators on this difficult subject. Extra interest is given to the paper by the recent publication of the Fifteenth Report of the Committee for the Investigation of the Deterioration of Structures in Sea Water, which is reviewed elsewhere in this issue. The latter gives chiefly the results of practical tests, but the above paper gives theoretical explanations of a few of the effects noticed. For instance, it is stated that ordinary copper or low chromium steels will not corrode appreciably in industrial atmospheres, because they are to a certain extent acid resisting; in water, however, due to the metal not being perfectly homogeneous, corrosion is intensified locally instead of being resisted uniformly, and is further aggravated in the sea through the composition of the water itself. One of the most important points in the paper is the conclusion that the manufacturing process of the steel has no influence upon its rate of corrosion. Equally valuable is the way the author deals with the common saying that modern steel corrodes more readily than pre-war steel. He shows that the real difference is due to the present-day speed of construction, which does not give the plates time to age and become descaled. Mill scale is the cause of severe local corrosion.

* * * *

Permanent Way Developments in Italy

As in France, Germany and other countries of the European continent, comprehensive improvement of the permanent way has been in progress for some years past in Italy in preparation for much higher speeds. The basic work has been to improve the drainage, and to renew the ballast and increase its depth. Broken stone up to the extent of 1,500,000 tons a year has been used for this purpose. Heavier rails weighing from 92 to 100 lb. per yd. have been laid on the main lines, and the number of sleepers increased, in addition to improvements in the fastenings of the rails to the sleepers. Not merely has the thickness of the ballast been increased but it has been consolidated and the sleepers firmly packed by means of power tampers, an interesting feature of the latter being that where the line is electrified on the 3,000-volt d.c. system they have been driven from the traction circuit. Rail joints have been reduced in number by the welding together of rails up to 90 metres in tunnels and 30 metres in the open, both electric and Thermit welding having been used. Now rails are being rolled up to 36 metres in length. Extensive realignment of curves has also been undertaken and permitted maxima of 100 m.p.h. are expected shortly.

* * * *

Collision Buffers

In his paper entitled " Impact of Railway Vehicles in Relation to Buffer Resistance," read before the Institution of Locomotive Engineers, the author, Mr. R. T. Glascodine, made special reference to the so-called " collision buffer " in general use on carriages on many British railways. In this the final blow does not come home solid metal-to-metal, but is taken by rubber springs outside the headstock, which are specially arranged to cushion the blows above such pressures as usually drive home the ordinary running springs, namely those behind the headstock. These buffers have been involved in many railway accidents, and it is usually noted that the Ministry of Transport Inspector in his report makes favourable reference to their behaviour. A buffer of this kind, fitted to some thousands of wagons in Argentina, was exhibited at the Buenos Aires Exhibition in 1931, after having been in service for 20 years, and was certified as fit for further service. This exhibit probably did more than any mere verbal claims to confirm the excellent reports previously given of the buffer. In this country, also, a number of wagons on one railway have been fitted with a buffer of similar type and disposition, and very little in the way of repairs to the headstocks has been necessary. The buffers in question have not an abnormally high capacity; 35 to 40-in.-tons up to 50 tons pressure is all that can be reasonably claimed. The heavier loads will produce additional movement, but such movement is small. It would appear that the chief advantage in the use of rubber lies in the moderation of the intensity of the stress producing acceleration, and in the effect of the blow.

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Improving and Standardising Buffers

In another part of the paper above referred to, the author said that, at the present time, in many parts of the world the question of improving or standardising buffers is under consideration. It is therefore to be hoped that the general inadequacy of buffers may be so appreciated that a movement will arise to secure a higher degree of efficiency in protection of rolling stock, with a corresponding economy in maintenance. It is realised that the structure has to take up to potentially one-quarter of the kinetic energy of the moving wagon, and that this can be done only by yielding. The force of impact is applied at a point on the buffer face; it is then distributed over the area supporting the spring or other resistance, and passes through the parts (of relatively light section) forming the buffing gear. Finally it is distributed through the members of the structure to the load. The function of the buffers is therefore to act as yield-pieces, which will take up a considerable amount of the energy, giving much movement whereby the accompanying stress will be kept at a lower figure. Further, it is desirable that particular attention should be given to the design of the wagon structure which should be flexible, rather than rigid, so as to assist in minimising the intensity of the stress produced by heavy shocks of impact.

The Trouble with the Railways

A REMARKABLE address was recently delivered to a traffic club in the U.S.A., under the title "Change Rules the Rails," by Dr. C. M. A. Stine, described by Mr. Francis P. Garvan, President of the Chemical Foundation Incorporated, as one of industry's "foremost and most foresighted scientists." Dr. Stine, concerning himself with the troubles from which the railways are suffering, put forward as a main solution the application of scientific research. He did not claim that this would be a complete solution of all railway difficulties but, as an indication of how effective it might be, he outlined what the industrial scientist had already done for the automobile, the aeroplane, the rubber and petroleum industries, for lumber, paper, textiles, and indeed for most of the industries whose goods the railways hauled. Although recognising that it was the railways which had made our modern industrial structure possible, he considered that it was not what the railways had done but what they had left undone that was the cause of their present plight. Dr. Stine's paper abounded with the most remarkable records of invention tending always to increase output and reduce the energy expended to achieve it. The whole tenor of his theme was that there was still enormous scope in this direction for the railways; but Dr. Stine did not seem to recognise the inevitable result of what he advocated, namely, that, as a country becomes more industrially efficient, so it is able to produce both goods and services with less and less labour; in fact the most efficient countries should be those with the greatest number of unemployed—as, indeed, they generally are until industrial activity turns towards warlike preparations. But the only source from which people derive the means to enjoy the output of industry is the monetary reward of labour, and this tends to shrink as mechanisation increases. "As men cease to earn wages," said Sir Stephen Demetriadi, addressing the annual meting of the London Chamber of Commerce on Tuesday, "they become unable to consume, so that the machines which have displaced them will also presently cease to work, because goods are not for long produced if people have not the money to buy them. It is a vicious circle; machines stop men working and, because men have stopped working, the machines themselves have to be stopped working, since men no longer have the wages with which to buy the product of the machine." This problem of lack of demand from the very people whose industry and ingenuity has produced the plethora of goods and services is the root cause of the ills from which the railways suffer, and, so long as it remains unsolved, the suggestions of Dr. Stine, while giving the railways a temporary advantage over their competitors, would in the long run tend only to aggravate the disease.

* * * *

Ultra High-Speed Trains

IT is fortunate that we should be able to include in the same issue details of high speed railway running in both Great Britain and Germany. The highest standard of British speed is represented by the journeys of the L.N.E.R. Silver Jubilee express, detailed on page 1130; some remarkable feats of German speed, recorded during the recent visit to that country of the Institution of Locomotive Engineers, figure on page 1132. Pre-eminent among the latter was the performance of one of the latest 4-6-4 streamlined steam locomotives, which in the course of a return journey with a special train between Berlin and Hamburg maintained, notwithstanding several intermediate stops and slowings, an average speed of 91 m.p.h. over no less than 250 miles of the round trip, reaching or slightly exceeding 100 m.p.h. at a number of different points and attaining a maximum speed of 115 m.p.h. From the test point of view it was, perhaps, a little unfortunate that the gross load was as light as 142 tons; but the details show that 100 m.p.h. was being maintained on two-thirds regulator and 20 per cent. cut-off, and that less than full regulator sufficed to produce an acceleration, on level track, to 115 m.p.h., with unaltered cut-off, so that there was evidently plenty of power still in reserve. By contrast with this the "high lights" of the British locomotive's performance with a 230-ton train are seen in particular in the maintenance of an average speed of 81·6 m.p.h. up the ascent from Essendine to Stoke summit, with no lower minimum than 77½ m.p.h. on the final 1 in 178. As regards maximum speed, also, it will not readily be forgotten that the British locomotive, on September 28 last, with the same load, maintained an average speed of 100 m.p.h. for 43 miles continuously, and over 70 miles of undulating road, including several lengthy stretches of 1 in 200 up, until cut short by the service slack through Peterborough, put up an average of 91·8 m.p.h.

The British and the German engines so compared are designed for very similar services. The customary task of one of the German 4-6-4's is to come in from Hamburg to Berlin with the morning non-stop FD service, allowed 145 min. for the 178·1 miles, and to return with the corresponding evening train, allowed 144 min. These respective averages of 73·7 and 74·2 m.p.h. must be maintained over a road which throughout is almost level; through the midway junction of Wittenberge speed must be reduced to about 40 m.p.h., and there is restraint on speed through the suburbs of both Berlin and Hamburg, affecting some 15 miles or more of each journey. Careful examination of the figures on the test journeys shows that, without stops or out-of-course signal or permanent way checks, the journey from Hamburg to Berlin could have been completed in 133 min., or in 4 min. less than the time allowance of the diesel-operated Flying Hamburger, and 12 min. inside the schedule of the steam-operated FD train, at a start-to-stop speed of just over 80 m.p.h. The run from Wittenberge to a signal check outside Spandau—70·1 miles in 48 min. 32 sec., at a start-to-stop average of 86·7 m.p.h.—provided a telling illustration of the engine's speed capacity. In normal working the train consists of four corridor coaches of the latest type, with restaurant car, weighing about 210 *tonnes*, and so closely approximating to the weight of the Silver Jubilee train; but the German coaches are not streamlined.

By comparison, the Silver Jubilee is booked from King's Cross to Selby, 174·4 miles—almost exactly the same distance as from Berlin to Hamburg, and Selby must be passed dead slow because of the swingbridge and curve—in 144 min., at an average of 72·8 m.p.h. Included in this is a slack to 15 m.p.h. through Peterborough and various slight slowings roughly corresponding to those of the German journey, but the L.N.E.R. train is set a considerably harder task than the German in the grading of the British route, with its 1 in 105 ascent out of the London terminus, and lengthy stretches of adverse gradient at between 1 in 200 and 178. On balance, therefore, the L.N.E.R. booking appears to be the harder of the two, as well, of course, as being more prolonged, though at not so high a speed, for another 94 miles from Selby to Newcastle; in any event, it proves that British locomotive power is just as competent to supply high speed travel as German. But whereas the Silver Jubilee shares with the Bristolian the distinction of being the only city-to-city services in Great Britain of an ultra-high-speed type—that is, booked at well over 60 m.p.h. from one terminal to the other—the German Berlin-Hamburg flyer is but one

of numerous high speed services, in which steam, electricity, and diesel propulsion all play a notable part.

As the article in this issue shows, the modern German diesel-electric high speed trains, which travel at 100 m.p.h. over favourable stretches of line, can be worked in multiple-unit formation, and are thus not rigidly limited in capacity. The passenger accommodation is very comfortable, and there is provision for hot as well as cold meals; also, even on these very fast timings, the journey described includes a gain on schedule of 21 min. on the section between Nuremberg and Leipzig alone. Electric locomotives are now in use in Germany capable of working trains of nearly 700 tons gross weight over level sections of line at sustained speed ot well over 70 m.p.h., as again the article witnesses. No expense has been spared in preparing the main lines for fast travel and the smoothness of riding at the highest speeds is most remarkable. All classes of train have participated in this country-wide speed-up, which has been made possible, in the first instance, by fitting all wagon stock with continuous brakes, and so working freight trains—which otherwise, and not the high speed expresses, " monopolise an undue share of the running lines "—at speeds of 40 m.p.h. or so. This was a fact of which members of the Institution of Locomotive Engineers were made constantly aware during their journey by steamer up the Rhine, as they watched the heavy freight traffic passing along the main lines on both banks. As a result of these far-sighted preparations for speed in Germany, more intensive use of staff and stock has been made possible, while the railway services, it need hardly be added, have gained proportionately in their popularity with the public—a fact which, again, is emphatically corroborated in the record of the Silver Jubilee, on which it is now difficult to obtain a seat without booking well in advance. Fortified by careful and precise statistics, indeed, the German State Railway Administration is assured in its conviction that " high speed pays."

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Kenya & Uganda Railways and Harbours

THE financial results of the working during 1935 of the combined railway, road, harbour, and steamship services in Kenya and Uganda have completely re-established the financial position of the administration. This, as shown by the report, which has recently reached us from Brigadier-General Sir G. D. Rhodes, the General Manager, is due chiefly to the highly successful efforts to reduce expenditure, but also partly to a steady increase in traffic from both territories and more particularly to a succession of excellent crops in Uganda. The services operated consist of 1,622 miles of open lines (metre gauge), 3,723 route miles of steamer services and 75 miles of road motor services for passengers and goods. Combined earnings of the railways and harbours for the year ended December 31, 1935, amounted to £2,793,845, an increase of £233,805, or 9·13 per cent., on 1934. The combined ordinary working expenditure of £1,243,831, exclusive of contributions to renewals funds, shows an increase of 10·42 per cent. The net earnings balance of £1,210,495 over total expenditure on revenue account gives a return of 5·48 per cent. on the total capital expenditure of £22,087,956, and of 8·65 per cent. on the interest-bearing proportion (£13,999,944) of this total, a most satisfactory achievement. This balance covers interest and sinking fund charges of £847,723, leaving a surplus of £362,772. Comparative results of working the railway services (inclusive of lake steamers and motor transport services, but exclusive of harbour services) are shown in the accompanying table.

Goods traffic earnings were 8·23 per cent. above those for the previous year. The fall in freight ton-mile receipts is due partly to rate reductions and partly to the fact that the tonnage conveyed at the low exceptional and export rates increased in greater proportion than the class rate tonnage. Following the practice introduced in 1929 an index of efficiency has been compiled covering the years 1926 to 1935, the year 1926 being taken as the datum year. The final index figure has shown a steady advance each year to that of 148·94 in 1935. These efficiency figures have been supplemented in the reports for 1934 and 1935 by a series of graphs which give a vivid picture of railway and harbour operations. Lubricating costs are being steadily reduced and the number of wagon axle-miles run per wagon hot box shows continual improvement. There was a slight increase in engine fuel consumption due to the increase in the average net train load. The figure of miles per engine failure (131,601) was not so great as the exceptional performances (205,884) achieved in 1934, but was nevertheless satisfactory. The introduction of the systematic intermediate repair of locomotives during 1934 has abundantly justified itself. The mileage between general repairs of the engines handled for this class of repair during 1935 has been increased from an average of 78,550 miles to an average of 95,911 miles, with a resultant reduction in maintenance cost per 1,000 miles in services. The concentration of this class of repair at the workshops and its systematisation are to some extent responsible for the further reduction in operating costs in the running section. During the last six months of the year preparations were actively in hand for the building locally of eight new all-steel welded caboose coaches.

	1935	1934
Passengers	481,501	484,138
Tons	863,096	756,832
Train-miles	2,729,821	2,435,176
Public freight ton-miles	334,431,796	281,448,745
Operating ratio, per cent.	45·63	44·64
Public ton-mile receipts	12·680 cents	13·918 cents
Average haul, miles	388	373
	£	£
Passenger receipts	159,833	163,037
Goods receipts	2,122,556	1,961,105
Gross earnings	2,384,923	2,227,285
Working expenditure	1,088,185	994,287
To renewal funds	336,067	336,047
Miscellaneous receipts (net)	18,791	103,301
Net revenue	979,462	1,000,252
Loan charges, etc.	632,301	614,003
Surplus	347,161	386,249

The improvement in the time occupied per wagon journey noted in 1934 was maintained during the year under review. In 1933 it was 12·96 days, which fell in 1934 to 11·34 days; in 1935 there was a further fall to 10·30 days. The ton-mileage moved per wagon was again increased from 78,751 in 1933 to 81,977 in 1934, and 95,941 in 1935. The average load per 12-ton wagon unit rose from 8·01 tons in 1934 to 8·11 tons in 1935, the average net train load from 198 tons to 201, and the wagon miles per engine hour from 266·84 to 284·62. Engine miles per day per engine in use rose from 83·79 miles to 91·43 miles. The decision to allocate £150,000 for further rate reductions with effect from December 1, 1935, provided an opportunity for reviewing the whole tariff structure. After the most careful consideration, it was decided to maintain more or less unchanged the previous policy and to grant relief where it was thought it would be most useful and effective. This decision was made possible by the determination of the Government of Kenya to continue for another three years the existing policy of protection against wasteful and uneconomic road transport between the coast and certain up-country stations, otherwise the whole of the amount available would have had to be applied to commodities in Classes 1, 2, and 3.

PUBLICATIONS RECEIVED

Deterioration of Structures of Timber, Metal and Concrete Exposed to the Action of Sea-Water. Fifteenth Report of the Committee of the Institution of Civil Engineers. Edited by S. M. Dixon and H. J. Grose. London: H.M. Stationery Office. 9¾ in. × 6¼ in. × 1 in. 138 pp. Illustrated. 12s. 6d. net.—Although this is the fifteenth report issued by the committee since the investigation started in 1916, it can be studied intelligently without reference to the earlier ones, as it is a connected account of the whole of the investigations which have been carried out to date, and gives the conclusions reached so far. It is divided into four sections, namely, (1) The Preservation of Timber; (2) The Corrosion of Steel and Iron; (3) The Preservation of Steel and Iron; and (4) The Deterioration of Reinforced Concrete. Each section begins with a general account of the work carried out and gives a list of the conclusions reached. This is followed by a detailed explanation and examination of the experiments in each group, illustrated by a series of extraordinarily fine photographs of specimens in different stages of corrosion and also by well-arranged graphs and tables of figures folded so that reference can be made to them without constantly turning over pages.

In the investigations, the committee kept in view the practical side of the questions under consideration, although of course scientific aspects arose occasionally, but complete biological or chemical examinations were not attempted. Specimens were exposed in many different parts of the world, ranging from England to New Zealand, and the West Indies to Singapore. Although the subject is complicated, as is necessarily so with research work, this report is very readable for those who wish to gain a working knowledge of the results. The chapter on timber should be read by all engineers who want to have general technical knowledge, and that on corrosion of steel shows amazingly the effects of sea water. One useful detail in this latter section is that the photographs of corroded specimens are dimensioned so that a better idea of the size of the defects can be gained. The part of the report dealing with concrete is not so complete, but this is because the investigations on the material were not begun until 1929, *i.e.*, much later than those on timber and steel.

Willing's Press Guide, 1936. London: Willing Service, 356-364, Gray's Inn Road, W.C.1. 8½ in. × 5½ in. × 1 in. 510 pp. 2s. 6d. net.—This, the sixty-third annual edition of this most useful and modestly-priced publication, has been carefully revised, and forms a reliable and comprehensive guide to the British Empire and foreign press. The sections relating to the various classes of publications have been arranged in convenient chronological lists, with all the principal particulars concisely set out under the title of each paper. Ready reference is thus facilitated to any particular information desired, whether it relates to a London, provincial, overseas, or foreign publication. There are also lists of the London addresses of provincial, Empire and foreign publications, and of reporting and news agencies. A particularly useful section is that devoted to recent titular changes, amalgamations, and new publishing ventures, which have been incorporated up to the latest practicable date. The reputation for accuracy and completeness which "Willing's" has built up for itself is fully maintained in this edition and it is not surprising to learn that the demand for this and the preceding issue has exceeded the publishers' anticipation.

North Pembrokeshire—A Book for Hikers. By E. Roland Williams. London: Great Western Railway. 7¼ in. × 4¾ in. 135 pp. Fully illustrated. Folding map. Paper covers. Price 6d. net.—The Great Western Railway, in securing Mr. E. Rowland Williams to write about the joys of hiking in North Pembrokeshire, has done a great service for those who seek out the unusual corners of our island home. Indeed, all who are contemplating an outdoor holiday will do well to read what Mr. Williams has to say, irrespective of whether they are visiting Pembrokeshire or Cornwall, as there are 35 pages of prefatory remarks which are packed full of excellent advice. The main part of the booklet is devoted to descriptions of some sixteen suggested routes which the rambler might follow if he wishes to see the rugged Welsh scenery at its best. Each of these is illustrated by a neat map and numerous half-tones, and here and there a small black-and-white sketch is introduced to enliven the text. Mr. Williams has also included a few chapters on certain aspects of the topography of North Pembrokeshire, and among these there is a short description of the railways which serve the district.

Synthetic Resin Finishes.—A catalogue in colour received from Robert Kearsley & Co., York Road, Ripon, gives a good impression of the handsome liveries that have been applied to the road vehicles of important municipal and other transport undertakings by the use of Nulac synthetic resin coach finishes. All the liveries illustrated are selected from those in actual service either at home or abroad. The firm has had extensive experience of the requirements imposed by overseas climatic conditions, and among the users of its finishes are the Capetown tramways, where they have been adopted for a fleet of trolleybuses. The coloured illustrations in the catalogue show the variety of shades available, and it is satisfactory to read in the letterpress that the gloss characteristic of Nulac finishes when new is retained in service. This is not only of value from the point of view of appearance, but the hard finish is easily cleaned and has less tendency to collect dust and dirt.

Methods of Applying Wood Preservatives.—Part I of the report on this subject by the Department of Scientific and Industrial Research has now been published (price 6d.) by H.M. Stationery Office, and deals with non-pressure methods. Surface treatments, steeping, and open tank treatment are the processes described.

Aluminium Paint.—The Aluminium Union Limited, Bush House, Aldwych, W.C.2, has introduced a new aluminium pigment, known as Alpaste, for preparing aluminium paint, and sends us an illustrated booklet in which the advantages of painting with aluminium are emphasised. A useful table is included giving specifications of paints for a variety of pruposes made with Alpaste pigment. Among the properties of aluminium paint is its high reflecting power, which makes it a valuable external treatment for railway vehicles used in hot climates. This is strikingly demonstrated in one of the illustrations in the booklet, where the amount of reflection from the aluminium side panels of a coach (which assists in the maintenance of a cool interior) is contrasted with that from the unpainted roof. Aluminium paint is also highly resistant to corrosion. Some of the advantages of such paint made with Alpaste are its high opacity, greater durability than paints prepared from powder, and improved covering power (10 to 20 per cent. higher than that of powder-made paints).

Bakelite Progress.—The constantly extending range of applications for Bakelite is well illustrated in a new booklet which we have received from Bakelite Limited, 68, Victoria Street, London, S.W.1. This material has already won favour for various railway purposes by reason of its lightness and durability, and is used throughout the new rolling stock of the L.N.E.R. Hook and Antwerp Continental (described in our issue of May 8) for framing views and advertisements in the compartments. Among the novel uses of Bakelite illustrated in the booklet is its adoption for the motor case, bracket, blades, and feet of an electric fan, wherein the material is particularly suitable by reason of its resistance to the heat generated by the motor, and the insulation it affords against electric shocks. It may also be supplied in several colours, so that the fan can be selected to harmonise with a given scheme of internal decoration. Desk and table-tops are other purposes to which Bakelite is well adapted by reason of the attractive finishes in which it is available, and its easy cleaning properties. Its suitability for such accessories as ash-trays and small electrical fittings is already well known.

THE SCRAP HEAP

The Immorality of the Railroad

The year 1845 will ever be notable for the great railway mania. The methods adopted by the promoters were in many cases of doubtful honesty—and sometimes of undoubted dishonesty—and the following reprint of Part I of a scarce pamphlet of 1845 is an interesting commentary on one aspect of what was then the "all-engrossing subject"—the railroad

"And they covet fields and take them by violence: and houses and take them away, so they oppress a man and his house, even a man and his heritage." Micah 2nd chap., verse 2nd.
"Some remove the landmarks." Job 24th chap., verse 2nd.

We remember some thirty years ago there was a plant very common in our gardens, which, as children, we valued not so much for the beauty or sweetness of its flowers, as for its name, and the singularity of its seed-pod, which was something in the shape of an oval shield, broad and transparent, totally unlike the seed-vessel of any other plant with which we were acquainted. The name of this plant was "Honesty."

Since we have arrived at man's estate, we have looked in vain for this old favorite of our boyish days; it has vanished like many other old English plants and flowers, to make room for the more gay and dazzling productions of foreign lands. We have often mused upon this, as emblematical of the times in which we live; as old Honesty has disappeared from the vegetable world, so we fear common Honesty has departed from the moral and political world. In vain do we look for an honest man just and true in all his dealings; such an one would in this day be considered as unfashionable, as the plant of which we have spoken.

It is reported that at the time when the country was agitated by the Reform Bill, a certain honorable Member of the House of Commons, delivered himself of the following speech;—"What David said in haste, I say deliberately, *all men are liars*;"—if the treachery and violence of the age of Reform called forth this taunting proverb from an honest mind, how much more applicable would it be now, in this age of Railways. There is perhaps scarcely a Railroad in the country, which, if the earth and stones could speak, would not tell a tale of oppression, fraud, and injustice. It has been our lot to watch the progress of one line through the parish in which we live, and if the transactions of that portion are a specimen of the proceedings throughout the line, we only wonder that any man of common honesty can ever be connected, directly or indirectly, with these concerns.

Fraud is the first step. The exposures that have lately taken place sufficiently prove this. The money transactions of these speculations at the outset are often of the most dishonourable kind;—the gambling as atrocious as that of any of the "Hells" in London or Paris. Then comes the Surveying, which is quite in character.

A line is projected through a certain part of the country, through houses and lands of ancient and private property. The Proprietors and tenants naturally consider the lands and tenements of their ancestors as sacred; according to the good old English proverb, that "in England every man's house is his castle;" and upon this principle they refuse to admit those public trespassers, called Surveyors. A mob is then hired and collected, and these headed by persons calling themselves gentlemen, make a violent and forcible entry upon private property.*

A forcible survey being thus made, next follows the Act of Parliament, which is in admirable keeping with the previous proceedings. In the usual legal notices printed and published in the Newspapers of the intended Acts, we find the following clause or clauses, viz., that "it is intended to apply for powers for the *compulsory* purchase of lands and houses described in the plans, and also for power to vary and *extinguish* all *rights* and *privileges;* or to purchase lands by *compulsion* or agreement."—Now there can be no mistake here about words or their meaning; the projectors of these schemes in plain English, declare, that it is their deliberate intention to obtain an Act of the Legislature, which will enable them to *compel*, that is *force*, people to give up their land and their houses; the rich man the land of his ancestors, the poor man, the cottage, garden, or field, which he and his forefathers have tenanted and cultivated for many generations.

It is true the Act speaks of *purchase* and *agreement*, and a price is offered, but the owner has no choice left; if he will not sell, a *compulsory* purchase is to be made. Thus Ahab offered to Naboth a price for his vineyard, and doubtless would have given him any price; but when Naboth would not *sell*, he took it by violence and *compulsion*. —Well, the Act is obtained. Then comes the seizure. The Landlord or Proprietor receives his money, *he* has some remuneration for the spoilation of his property, but woe to the poor tenants. A gang of labourers is hired, crops are destroyed, hedges and fences removed, fields cut in twain, gardens and orchards laid waste, houses and cottages levelled with the ground, and the cry of the injured and oppressed is soon drowned in the roar of the engine and the rattling of the train. Some consolation is indeed offered by the spoilers to the sufferers, such as it is. The Farmer is told that the Railroad will open a way for a more speedy and profitable disposal of his produce at distant markets, though the only practical experience he has of its benefit, is the occasional decapitation of a cow or a sheep; and the poor man is consoled for the loss of his cottage and garden by the promise of a pleasure trip to some great manufacturing Babel, such as Birmingham or Manchester, that thus by acquiring a spirit of wandering, he may cease to think of his hills and dales, and to mourn over the loss of his cottage and garden; and as if more effectually to break up the fountains of domestic happiness, the very children of the poor are enticed away to distant towns, by juvenile pleasure trains, where, far from the eye of their parents, they may acquire a taste for the vices of the town, and are exposed to numerous temptations.*

So much for the morality of the Railroad.

THE
RAILROAD.

CONSIDERED IN A MORAL & RELIGIOUS POINT OF VIEW

BY

A SPIRITUAL WATCHMAN
OF THE
CHURCH OF ENGLAND

"Be not partakers of other men's sins."

LONDON:
HOULSTON AND STONEMAN,
W. ROWBOTTOM, ST. MARY'S GATE, DERBY
1845.

PRICE TWOPENCE.

* We have been informed on good authority, that on a recent occasion, a most glaring instance of this kind of outrage occurred, not many miles from our county town. A gentleman of considerable landed property had refused to allow his land to be surveyed for an intended Railroad, and was determined to resist the survey; a mob of several hundred persons was hired at the rate of 5 or 6 shillings per day, and regularly organised for the occasion; a considerable number had bludgeons and wore ribbons in their coats. This mob appeared to act under the direction of two persons in a carriage; one said to be a magistrate, the other a town-councillor, who, in addition to being partially intoxicated, used the most violent and abusive language towards the owner of the property and the clergyman of the parish; and had it not been for the forbearance of the landlord whose tenantry rallied round him to defend his property, a most fearful and perhaps fatal encounter would have taken place.

* The writer of these pages happened to be in Derby one day during the last summer, when one of these Juvenile Trains had arrived with some hundreds of young people from a distant town, and was shocked to see the public-houses and spirit shops filled with the youth of both sexes, many of them in a state of inebriation.

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

SOUTH AFRICA

Permanent Way Exhibit at British Empire Exhibition

Material is now being collected for a permanent way exhibit at the forthcoming British Empire Exhibition. It will include typical examples of the methods and types now used on the S.A.R., such as the latest standard steel sleeper with clipping arrangement where checkrailing is necessary, narrow gauge standard fastenings, comparisons of the heaviest and lightest, and old and new types, and the progress that has taken place in the development of the rail joint.

Tunnelling Works

In order to provide additional clearance through Langs Nek tunnel, in connection with other Glencoe-Volksrust improvements, the track through the tunnel is being lowered. Already it has been lowered to full depth over a length of 1,100 ft. and to a depth of 1 ft. over a further length of 700 ft. The whole job is expected to be finished by the middle of June.

Two new tunnels, one 1,800 ft. and the other 1,300 ft. in length, are also being constructed as a part of these improvements. Contrary to usual practice all these three works are being done departmentally and not by contract. The latter tunnel is in solid rock, requiring no timbering, and in both the new tunnels concrete lining is being used. The work is now well advanced.

RHODESIA

Express Delivery Service

To meet the demand for the faster transit of goods the Rhodesia Railways inaugurated last year a special express delivery service for urgent consignments, which, if handed to the railways by a certain advertised time, are available for delivery at destination at a definite time the following day. This is termed Red Label traffic, the name being derived from the special red labels issued by the railways to the public for use on their urgent goods. This service applies over the main line between Bulawayo, Salisbury and Umtali, and has recently been extended to the Selukwe branch. Red Label traffic handed in by noon each day at Bulawayo is delivered in Salisbury, 296 miles distant, at 8 a.m. the next morning, while special rapid transit is also given to goods handed in later in the day. A feature of the service is that no extra charge is made for the quicker delivery, while it has gained the confidence of the merchants by showing the reliability of the railways in providing rapid transport. Special arrangements are in operation for the prompt delivery of such traffic by the railway cartage contractors at Bulawayo and Salisbury, and this delivery to the customers' doors will also be made available at Gwelo, where cartage facilities are to be introduced in the near future.

Winter Seaside Holidays at Beira

The Rhodesia Railways are stimulating the interest shown in recent years in the development of the port of Beira as a winter holiday resort, by the extension of the excursion period from three to five months. Excursion tickets at single fare for the return journey are now available from any station in Rhodesia from May 1 to September 30, and reduced charges are made at the railway-managed Savoy Hotel at Beira. Much has been done by the local Portuguese administration to improve the amenities for visitors by developing the bathing beaches and by the withdrawal of the previously very stringent immigration formalities. The pleasant climate during the winter months coupled with the cheaper and shorter rail journey in comparison with that to the Union seaside resorts, is likely to draw more Rhodesian holiday-makers than ever before.

Extended Use of 80-lb. Rails

The placing of an order by the Rhodesia Railways for the supply of 20,366 tons of 80-lb. 40-ft. R.B.S. flat-bottomed rails was mentioned in THE RAILWAY GAZETTE of February 28 last. These rails, together with 800 tons of fishplates, are required for the renewal of the main line on the Salisbury-Hunters Road section, a distance of 160 miles, the biggest relaying programme for many years. The existing rails weigh 60 lb. a yard, and the decision to strengthen the track on this section foreshadows the gradual replacement with 80-lb. track throughout the main line in coming years. At present the 74-mile deviation between Deka and Victoria Falls, constructed in 1930-31, is the only section of the main line provided with rails heavier than 60-lb. The orders for the material representing approximately £150,000 have been placed in England, and deliveries will be made via the port of Beira. The relaying is expected to begin in May and to last about twelve months.

ARGENTINA

Civil Engineers' Railcar Trip

On April 20, the members of the Buenos Aires Association of the Institution of Civil Engineers were invited by the State Railways administration to make a trial trip on one of the 34 new diesel railcars recently acquired by them for service between Cordoba and Capilla del Monte, and described in the *Diesel Railway Traction Supplement* for May 15. By the courtesy of the management of the Cordoba Central Railway, the only narrow-gauge railway running into Buenos Aires, the trip was made over that line from Buenos Aires to Villa Rosa, a distance of 52 km. The party, which numbered 120, included the following:—

Mr. C. R. S. Harris (Director-General, B.A.G.S. & B.A.W.R.), Major Oscar Lowenthal (General Manager of those lines), Señor P. Belfiore (C.M.E., Argentine State Railways), Señor Benavidez (Secretary, Chilean State Railways), Señor José A. Pettis (Chief Construction Engineer, Argentine State Railways), Messrs. F. L. Creswell (Chief Engineer, B.A.G.S. & B.A.W.R.), J. W. H. Rea (C.M.E., B.A.G.S. & B.A.W.R.), G. N. Williamson (Chief Engineer, B.A. & P.R.), J. H. Taylor (Chairman, B.A. Association of the Institution of Civil Engineers), and K. N. Eckhard (Supt. of Electrification, Central Argentine Railway).

Rubber-tyred Railcars

The combination of rubber tyres and guiding wheels for railcars—the invention of Mr. E. C. Noble, former Chief Mechanical Engineer of the Entre Rios Railways, described and illustrated in THE RAILWAY GAZETTE of December 15, 1933—has now been under trial on those railways for some time, and is reported to have proved both practical and reliable. A set of N.A.P. air-cushion tyres with guide wheels has recently been ordered by the Buenos Ayres Great Southern Railway for a six-wheel Chevrolet road bus which is being modified to run as a railcar. A Buenos Ayres Pacific railcar is also being equipped with four of these tyres: in both cars the tyres are fitted to steel centres and flanges.

FRANCE

Blue Train Cancelled Owing to Strike

Though the Blue Train from Paris to the Riviera ran as usual on the night of June 7, the corresponding northbound train was cancelled as the Wagons-Lits employees were on strike: the first time such a thing has happened since the inauguration of the train in 1922.

Combined Rail and Air Travel

Facilities for long-distance travel by means of combined railway and aeroplane tickets are now available in France [as briefly mentioned in our notes and news columns last week.—ED. *R.G.*].

Desiring to travel from Roubaix to Marseilles, for instance, a passenger may obtain a joint ticket, comprising a railway ticket to Paris and an aeroplane ticket from Paris to Marseilles. With a combined return ticket, a traveller may go from Paris to Marseilles by air and return by rail, or vice-versa. Provided with a ticket for a circular trip, a passenger may travel, for example, from Paris to Marseilles by rail, Marseilles to Algiers by air, Algiers to Casablanca by rail, returning by air to Toulouse and then by night train to Paris. As the return tickets

are interchangeable, passengers may travel by air or rail as they please. They will have the benefit of the usual lower fares for return tickets, but as air and rail rates differ, there may in some cases be a supplementary charge instead of a reduction.

EGYPT

Bab-el-Louk to Helwan Improvements

H.E. the General Manager has approved of the following modifications in regard to the Bab-el-Louk—Helwan improvements at an estimated cost of £E. 44,050.

(1) To leave Bab-el-Louk station as it stands except for minor track alterations.
(2) To build a new engine shed and workshops on railway land at Tura.
(3) To double the line between Bab-el-Louk and Sayda Zenab.
(4) To remodel Sayda Zenab station providing for passenger and goods accommodation.
(5) To remodel Helwan station.

In addition to the above works, two new block posts are envisaged, in anticipation of the replacement of the existing steam trains by diesel units.

Capital Budget Proposals, 1936-37

The undermentioned are some of the more important works included in the Capital Budget proposals of 1936-37. The sums mentioned against each represent only the amount to be spent in the current financial year.

	£E.
(*a*) Reconstruction of Nag-Hamadi bridge ... ... This will presumably allow heavy engines to run right up to Aswan.	17,000
(*b*) Locomotives and rolling stock to be ordered in 1936-37 :—	
10 locomotives at	6,000 each
10 two-car diesel-electric railcar units for working on the Helwan line.	
2 diesel shunting locomotives at ...	5,000 each
200 wagons at	275 each
(*c*) New locomotive workshops at Abu-Zaabal	27,000
(*d*) Completion of Tanta station remodelling	14,000
(*e*) Helwan line improvements ...	60,000
(*f*) Assiut new station building ...	5,000
(*g*) Remodelling of Gabbary yard between Didi-Kareem and Cabin 3	7,000
(*h*) Housing scheme at Abu-Zaabal ...	10,000
(*i*) Tawdeeb-Rod El-Farag line ...	15,000

INDIA

Mysore Railway Extension into British India

In the Council of State the proposal to connect Chamrajnagar in Mysore with the South Indian Railway metre gauge system was recently considered. Sir Guthrie Russell, Chief Commissioner of Railways, stated that the previous investigations, which showed only a moderate return after allowing for losses on existing lines, were now out of date. Motor traffic in the plains sections had since developed, and the return on capital must now be lower. The Government of India, he said, could not sanction the construction without a guarantee against loss, and the amount of the guarantee must depend upon the results of fresh engineering and traffic surveys. The Mysore Government was not prepared to bear the cost of further surveys, but in a counter proposal had offered to construct the ghat or hill section if control over the line was vested in the Mysore authorities. The Government of India was considering this counter proposal.

Retrenchment of Railway Staff

In view of the necessity for economy in railway expenditure, a certain amount of staff reduction will be inevitable. A meeting was recently held at Delhi between the Railway Board and the representatives of the All-India Railwaymen's Federation to discuss the method of selection of staff for discharge. Comparative inefficiency and short service were the two methods under consideration. The federation requested the board to adhere to the short service principle which was recommended by the Murphy Committee and accepted by the Railway Board. The Chief Commissioner of Railways stated that it was for the railway administrations to decide on the number of men required for the work to be done. The board was concerned with the principle to be followed in the selection of staff for discharge, and proposed to adopt the principle of selection on the basis of comparative inefficiency.

SPAIN

Labour Unrest

On May 22 the whole of the staff of the Central Aragon Railway struck work, and the service of the railway was completely suspended. The men's unions demanded a considerable rise in pay and a voice in the administration. The Government has issued to the press a note stating that it does not seem possible for increases in pay to be granted, seeing that the company is working at a loss, and increases in tariffs would result in diverting more traffic to the roads. The note further says that the Government deprecates outbreaks of this nature, precisely at a time when the railway problem as a whole is being considered, and preparations are being made " to present to the Cortes certain Bills to co-ordinate the main features of that problem and among them the social question which for some years past has been agitating the spirit of the railwaymen." The Central Aragon is a broad gauge railway with a route length of 421 km., the share capital of which is owned by the Northern of Spain.

A leading Madrid daily, *El Sol*, in a front page article entitled " Law and Order and Political Economy," points out that these two concepts are indissolubly connected. Without some guarantee of law and order, confidence will not return to enable industry to recover from the severe depression which is affecting the whole internal life of the country and especially the railways. At the same time the depression is giving rise to conditions which bear hardly on the poorer classes, and is preparing the way for propaganda in favour of a revolutionary change. *El Sol* goes on to say: " As regards the railways it remains to be seen if there is salvation for the big companies, either with or without some form of nationalisation. In any case it is vital to try and save the bond capital from utter extinction, seeing that it represents the results of the thrift of the best elements in the country, as well as some part of the share capital, the loss of which would also fall on the middle classes."

The Andaluces Company

The eventuality foreseen in the Decree of May 9, authorising the Minister of Public Works to take over the Andaluces Railway (see THE RAILWAY GAZETTE of May 29) has unfortunately become a material fact. The company notified the Government, on May 22, of its inability to continue working certain of its services, and so the " Comisario " of the State is now authorised under a ministerial order of May 25 to take over the railway and its equipment, and all the cash resources of the company. At the same time a circular has been issued to the staff, advising all concerned that the committee of the Western National Railway appointed to take over the working of the Andaluces system has now assumed control. The committee includes two of the National Western directors, Señores Patricia Morales and Victor Messa, and its General Manager, Señor Luis Morales.

Another Company also Ceases Operation

Following closely upon the taking over by the State of the Andaluces Railway, it is now announced that another company has fallen a victim to the prevailing depression, albeit a small one, the La Loma Electric Railway, working a 29-km. narrow gauge line between Baeza and Ubeda. Unlike the case of the Andaluces system, however, the State Railway Department will take over the La Loma line and add it to its existing system, one section of which, the Linares Tramway, actually connects with the La Loma line.

Nationalisation Schemes

The Minister of Public Works placed before the Government, at the Cabinet Meeting held in Madrid on May 29, a report on the present position of the Spanish railway companies, as exemplified by the recent failure of the Andaluces company to continue the service of trains, with the result that the whole of the company's system of about 1,000 miles has had to be taken over by the State. The Minister gave it as his considered opinion that the railway industry had ceased to be a

remunerative private enterprise, but at the same time it constituted a public service which the State could not allow to be abandoned. It was, he considered, useless to continue with palliatives and partial remedies such as repayable financial advances, and loans, and the problem must be faced as a whole, especially as some of the lines were nearing the end of the 99-year period provided for by their concessions. The only feasible solution in the opinion of the Minister was some form of nationalisation.

AUSTRALIA

New Locomotives and Faster Schedules on the Trans-Australian Railway

On May 1, Mr. G. Gahan, Commonwealth Railways Commissioner, announced that he would be calling for tenders for the supply of eight powerful locomotives to work over the 1051-mile section of the Trans-Australian Railway between Port Augusta and Kalgoorlie, with only one intermediate change of engines and without the additional water tank hitherto required to negotiate the long distances between watering stations. With these engines he hoped to inaugurate a fast schedule between Victoria and Western Australia, with air-conditioned coaching stock, prior to the celebration of the 20th anniversary of the opening of the railway (October 17, 1937). Following the success of the experimental air-conditioned car on the Trans-Australian line (previously referred to in THE RAILWAY GAZETTE), all lounge and dining cars on the Port Augusta—Kalgoorlie section were to be so equipped, and the equipment of the Central Australia route would, Mr. Gahan anticipated, follow if traffic warranted it.

NEW SOUTH WALES

First N.S.W. Air-Conditioned Car

The first air-conditioned passenger coach seen at Brisbane arrived there on the Sydney express recently. It is a day car, the first of its kind on the New South Wales Government Railways. Though the temperature outside exceeded 80°, the internal temperature varied by no more than 2°— between 70° and 72°— on this long run.

VICTORIA

Melbourne-Adelaide Service Improvements

Due to the improved efficiency of the Victorian Government Railways "A" class locomotives resulting from the modification of their front ends, as previously mentioned in THE RAILWAY GAZETTE, The Overland express from Melbourne to Adelaide has, since April 20, left Melbourne at 6.45 p.m. instead of 5.45—or 4.30 prior to October, 1934—arriving at Adelaide at 9 a.m. as hitherto. The immediate acceleration is therefore 60 min., or 135 min., since the autumn of 1934. Also there are now six trains, instead of five, each way weekly between Melbourne and Mildura, with a later departure and reduced overall time of 30-35 min. There are corresponding improvements in the reverse direction.

Diesel Railcar Successful Trials

So successful have been the trials of the diesel engine fitted to one of the V.G.R. A.E.C. railcars after little more than three of the stipulated six months' tests on the Fawkner-Somerton and Bendigo-Heathcote-Wallan lines, that it has now been decided to purchase four additional engines of the same type for railcars working on the Fawkner—Somerton, Wycheproof—Sea Lake—Kulwin, Tallangatta-Wodinga, and Mornington-Frankston lines.

UNITED STATES

Further Extraordinary Action by the Interstate Commerce Commission

Conforming to its amazing record of vacillation on the question of collection and delivery of merchandise freight, the Interstate Commerce Commission on May 23 suspended tariffs of the Eastern railways which would have gone into effect on May 25, providing free cartage such as is already afforded in the West and South. Two days previously the commission [as recorded on page 1078 in our issue of June 5. —ED. *R.G.*] had affirmed its refusal to suspend these tariffs, which were allowed to be filed at less than the statutory 30 days' notice by its express permission. Previously, on March 31, the commission suspended collection and delivery tariffs which were to have gone into effect on the following day, and the new tariffs, now also suspended, contained modifications designed to eliminate the major objections which had been raised to the earlier ones. Such inconsistency in a matter involving complex contractual arrangements is disruptive of rational planning by traders and railways alike, and can be attributed only to timidity in the face of the truculent attitude of the local cartage operators, who have been exerting political pressure and threatening strikes.

Awakening Public Interest

One of the greatest handicaps under which the American railways labour, arises from the lack of public interest in them. A generation has grown up since the war made up of millions of young people who have never travelled in trains and have no knowledge of, or interest in railway operations. The railways are now thoroughly alive to this handicap and are doing their best to overcome it. The Association of American Railroads' directorate has approved a comprehensive advertising and publicity programme, details of which, though not yet made public, are designed to re-awaken public interest in railways of a kind which the British railways enjoy. A happy augury for the success of such an enterprise may be seen in the development and spread in recent years of several organisations for members of the public who make a hobby of locomotives and railway operation in general. This development has been entirely spontaneous on the part of the public, but the railways have co-operated by offering cheap excursions on Sundays to railway workshops and other centres of railway activity. One of the most popular outings appears to be a train run for their benefit over lines ordinarily restricted to freight traffic.

THE NETHERLANDS

Reorganisation of Goods Traffic

On June 8 the Netherlands Railways will initiate a new form of co-operation with the Gelderland tramways. From that date they will depute to these tramways in certain areas the distribution and collection of railway parcels traffic. These areas will be centred upon Winterswijk, Arnhem, Zutphen and Deventer. The parcels will be carried by railway to Winterswijk and Arnhem, whence they will be distributed by the tramways. Inversely the tramways will collect parcels within the areas prescribed and bring them to these two centres for despatch by rail. All other railway stations in this district will be closed for parcels traffic, with the exception of the transport of large individual consignments to a single address, which will be sent to the nearest railway station, where they may be unloaded by the addressee. The stations remain open for the full-wagon-load consignment traffic.

Parcels and Full-wagon-load Consignments Collected and Delivered by Tramways

At a later date the system will be inaugurated in all four groups for parcels traffic and full carloads. These full wagon loads will be distributed or collected by the Gelderland tramways, thus providing door-to-door transport of such loads, also a new feature for the Netherlands Railways. In the more distant future full wagon loads will, however, be distributed from and collected only at the group centres, the other stations then being closed for car-loads also.

In connection with this co-operation the Netherlands Railways will withdraw their subsidiary, the A.T.O., from the district, and, on the other hand, the Gelderland tramways will co-operate with existing private road hauliers. With this reorganisation the railways hope to reduce the cost of carriage and staff (by the closing of stations) and to secure more traffic by using the private collecting and distributing agencies. If this reorganisation proves successful, the new system will be extended to other parts of the country.

ELECTRIC INTERLOCKING

A review of the development of electric interlocking, and its relation to mechanical interlocking

EVER since what to some seemed the bold step of installing a power signalling frame containing no mechanical locking was taken a few years ago, the relative merits of mechanical and electric interlocking have been much discussed. The subject is of great interest, for interlocking in one form or another is " the foundation of the art and practice of signalling as we know it today," as Mr. W. H. R. Webb expressed it in his paper read recently before the Institution of Railway Signal Engineers at Manchester. All interlocking devices are, of course, the embodiment of one fundamental principle, the prevention of mistakes in the operation of trains, and from that the other purposes which they serve are derived. It was inevitable that they should be mechanical to begin with, as were the appliances for operating points and signals. This condition obtained for many years after the origin of railways, and led to the evolution of the various types of mechanical apparatus familiar to us still, as well as of many others which have disappeared. The comparatively simple tappet locking apparatus, over sixty years old, has superseded the rather complicated contrivances for achieving the same end that once were common. To its simplicity must be added the desirable quality of reliability, for we cannot recall any serious accident attributable to a failure of tappet locking, and although it would be absurd to pretend that it has never been found defective, it is certain that there have been few, if any, more efficient devices used on the railways, considering the extent of its application and its constant use.

Origins of Electric Locking

This is no doubt one of the reasons why many engineers hesitated to abandon mechanical locking in favour of electrical methods, although electrical locking of various kinds is practically as old as tappet locking itself, and was even proposed for controlling the movements of levers in an ordinary signal frame before the principle had taken practical form. Electric locking came into existence with the earliest lock-and-block arrangements, and found further application in ground frame and opening bridge locking, being more widely used years ago, especially on certain railways, than many imagine. Single line token instruments, now nearly sixty years old, are a form of electric interlocking. The performance of these devices showed that such interlocking was reliable, but there was no question of replacing the tappet locking in lever frames by it, for nothing would have been gained then by doing so, and maintenance would probably have been made more difficult. A certain confusion of thought has crept into this question through a tendency to speak of electrical and mechanical locking as rival ideas, and to imply that the issue is one of clear-cut alternatives. Actually, it is the relative advantages of the two methods of locking for power signal frames that is the basis of discussion, a somewhat different matter. In power installations today, particularly under the conditions in which they are being used in this country, there are generally so many electrical locks and controls for track and route locking, detection, &c., that the transition to electrical lever interlocking is a logical step. It then becomes merely a question of good design—including that very important item, circuit design—and of construction and maintenance to ensure the necessary degree of security.

This fact was realised by some of the pioneers of the electrical working of points and signals. As long ago as 1874, in the discussion on Rapier's classic paper at the Institution of Civil Engineers, C. E. Spagnoletti, a former Telegraph Superintendent of the Great Western Railway, when describing his proposals for working semaphores electrically, and for what we now call intermediate signalling, said he could " lock signals and points, and signals and signals together, by this electric signal, as is now done, by simply making contacts, and thus remove all the complicated machinery now used." It is evident that he was looking forward to the disappearance of mechanical locking in favour of some electrical equivalent.

Nine years later an eminent French engineer, Edouard Brame, at one time a chief inspecting officer of railways, was sent by his government to see what had been done in other countries in electrical signalling, after the interest awakened by the devices shown at the Paris Electrical Exhibition of 1881. He was much impressed by what he saw in Austria-Hungary and published an article in the *Revue générale des Chemins de fer* in 1883 entitled " The Substitution of Electric for Mechanical Interlocking in Signal Cabins " and quoted the opinion of Monsieur Cossmann, of the Nord, that we must " one day expect to see the interior of one of these Saxby cabins, whence hundreds of appliances are manipulated, equipped with a source of electricity and commutators, enabling us to send the current into a number of receivers, which will replace the old levers and be interlocked with one another, no longer mechanically but electrically, by switch combinations." This shows that the idea of doing all the locking electrically is quite old and that the disappearance of mechanical signal frames in large cabins was looked forward to at least fifty years ago.

A Forecast of Relay Interlocking

Monsieur Cossmann's words read like a forecast of relay interlocking. He was reflecting on the idea of complete electric power signalling, with which that of electric interlocking, whatever form it may take, is naturally associated; he was not thinking of keeping the existing mechanical signalling and merely locking the frames electrically. Owing to the addition of so much electric track locking to some mechanical frames in recent years, the use of the apparatus has been suggested to perform some at least of the lever interlocking as well, which is perfectly feasible. When we lock a mechanical lever, however, by whatever means, we prevent the motive power from being exerted by the signalman on the function outside, but in a power installation the motive force exists in readiness and is turned on by the signalman through the controlling apparatus, and may conceivably be wrongly applied in the event of a defect in the equipment. It is to guard against this that such care is necessary when designing power signalling circuits, and it has led to the various cross-protection schemes and devices well known to signal engineers.

When everything design can do has been done, reliance has to be placed on construction and installation being in faithful accord with it, and on correct maintenance afterwards. Given these conditions there is no doubt that electric locking is as safe as mechanical, and which should be used in a given instance must be decided after considering all the circumstances. It may be that even in power signalling there will always be room for mechanical locking in some cases. The scientific attitude in the matter is, we believe, to be ready to use those appliances

which, always supposing fundamental safety requirements are met, promise to give the most satisfactory results, economic among them, in the conduct of the traffic at the place concerned. Those who have been somewhat reluctant to abandon mechanical locking have been criticised for their attitude in the matter, but a reasonable conservatism, which moves cautiously before making such a change, was justifiable, when we consider how serious is the responsibility resting on the railway signal engineer when recommending a departure from well-tried methods.

ACETYLENE WELDING ON RAILWAYS

Summary of papers presented to the International Congress in London

SEVEN papers devoted specifically to railway matters were presented to the XIIth International Congress of Acetylene, Oxy-Acetylene Welding and Allied Industries in London this week (see page 1134). The numbers, titles, and authors of the papers were:—

No. 4. Welding of rail joints. By Maurice Michaud.
No. 16. Notes on the use of the blowpipe in railway maintenance and on the building up of rails on the Polish railways. By Z. Dobrowolski.
No. 18. The training of specialised personnel in oxy-acetylene welding on railways. By A. Desgranges and M. Couturier.
No. 49. The Polish type of gas welded rail joint; laboratory tests and practical applications. By F. Golling P. Tulucz.
No. 50. Light all-welded railcars on the Polish railways. By A. Szumowski.
No. 59. Application of oxy-acetylene welding to the resurfacing of worn crossings and permanent way bonding on British railways. By C. G. Bainbridge and R. E. Doré.
No. 62. The use of oxy-acetylene welding and oxygen cutting on the Japanese railways. By H. Shibata and S. Otsuka.

Papers Nos. 4 and 49 deal with oxy-actylene welded rail joints. The former gives details of the results obtained with static and dynamic tests carried out on a type of joint having a progressive inertia soleplate. Only the heads of the rail and the two ends of the foot, which are easily reached by the blowpipe, are welded, and the soleplate, which is of double diamond shape about 35 cm. long, is welded to the sides of the rail foot. The work can be done *in situ* on rails which have formerly been joined by means of fishplates. About 300 of these joints have been made on the Polish State Railways, the earliest in November, 1934, and during 1935 several were made on railways in Indo-China, Spain and Portugal.

The characteristic of the joint described in Paper No. 49 is that the whole section of the rail is welded, after preliminary chamfering with the blowpipe, through the head, web and base by two welders working at the same time. A soleplate in the form of a sleeve is slid along the rail into position and is welded to the web from end to end, again by two welders working together. The sleeve is not a close fit on the flange of the rail, some amount of play being left to allow for irregularities in the latter. Some 500 of these joints, described as "pincers" joints, are now in service in the main lines of the Polish and Hungarian railways and on electric tramway systems, and so far are giving satisfactory service. They successfully withstood the sharp and prolonged frost of the winter of 1934-35.

In his report to the Rome Congress of 1934 Mr. Dobrowolski, the author of Paper No. 16, described the reconditioning of the first 350 crossings with the oxy-acetylene torch on the Polish State Railways. This work had been done by private companies, but so satisfactory were the results that the railway administration itself now undertakes such work and all track maintenance crews have been supplied with oxy-acetylene equipments, which are used, in addition, for the building up of battered rail ends and fishplates, reconditioning defective rails, and numerous other applications. A special steel rod, known in Poland as Tor, has been found to be the best for rail work. Check measurements of the resistance to wear taken on a large number of rebuilt crossings after thirty months' service showed that the amount of wear averaged 0·1 mm. per million gross tons of rolling stock carried, whereas the wear on new crossings under the same conditions amounted to 0·2 to 0·3 mm. High manganese cast steel crossings have also been successfully built up. The paper describes the precautions necessary to achieve success in the use of oxy-acetylene welding on permanent way and gives average costs of the work done. For example, the average cost of repairing a crossing in the track is given as about 30 gold francs, or 6 per cent. of the price of a new crossing.

Paper No. 18 describes the present situation in regard to the training of specialists in oxy-acetylene welding in various departments of the French main line railways and puts forward complete syllabuses. The great variety of the work carried out on a railway makes it necessary to have some centralised body, both of engineers and supervisory staff, to direct, advise and control the workers. The paper also deals with the conditions that should govern periodical checking of the welding personnel.

Mr. Bainbridge's paper (No. 59) briefly summarises the advantages claimed for the oxy-acetylene process of reconditioning worn crossings as: (1) A small, readily portable plant. (2) Low initial and maintenance costs of the plant. (3) A deposit having excellent wearing properties involving no detrimental effect on the rail structure. (4) No interruption to traffic; no preparation of the rail surface. (5) No other finishing beyond hammer smoothing has as yet been found necessary. The deposit is ductile and has only moderate hardness (270-300 Brinell) and is not subject to cracking or flaking. The weld metal is deposited with a special technique, and does not involve melting of the rail, therefore ensuring the least possible disturbance of the rail structure. The paper goes on to describe in detail the general procedure which has been adopted in this country for the building up of worn crossings, and analyses the results that have been obtained. The experience in this country, where the oxy-acetylene process was first applied in 1933, confirms that of the Polish railways that the wear on reconditioned crossings is less than on new ones. In connection with the training of welders for this reconditioning work, it has been found that a period of from three to six weeks is necessary for complete training, and it is not necessarily an advantage to use men with previous welding experience. The advantages of the oxy-acetylene welded type of rail bond are elaborated.

On the Japanese railways oxy-acetylene welding and oxygen cutting are widely used in the repair of rolling stock, many applications of which are described in Paper No. 62. A note on the necessary precautions for the prevention of accidents arising in gas welding and cutting is included.

In Paper No. 50 the methods of constructing the latest types of diesel railcar used on the Polish State Railways are described.

BRISTOL SIGNALLING ALTERATIONS

A description of the elaborate arrangements made by the G.W.R. for changing over from manual to power signalling

IN a previous article* the power signalling apparatus installed at Bristol Temple Meads has been described; the three boxes involved were introduced in the following order:—

Bristol Loco Yard box: December 10, 1934.
Bristol West box: May 26, 1935.
Bristol East box: November 24, 1935.

It is the purpose of this article to describe in some detail the work carried out by the Signal Engineer's Department in the transition stages from the original track layout to the final changeover from mechanical to power signalling on the greatly extended yard.

In order to appreciate the difficulties of the work, some idea of the traffic handled at Temple Meads station is necessary. The station can be considered as a double terminus, since many trains start from Bristol in both the up and down directions, with the addition of a considerable amount of junction work at the East and West boxes. At the east end of the station, the busier end, the traffic is greatly intensified by the working of goods trains to and from the goods yard. Owing to the geographical peculiarities of the goods yard a large proportion of the trains dealt with there have to be made up in the Kingsland Road sidings. This necessitates a number of trains working across the whole of the passenger roads in both directions. The train movements at Temple Meads are shown in the following analysis:—

(1) Passenger trains starting from Temple Meads—150
(2) Passenger trains terminating at Temple Meads—150

Most of these trains are brought in empty from the carriage sidings at the east end or at Malago Vale.

(3) Through passenger trains—150

Most of these trains change engines at Temple Meads.

(4) Trains amalgamated or divided—12
(5) Trains involving tail work—124

in which 159 vehicles are attached and 240 detached.

(6) Engines to and from Bath Road engine shed—270
(7) Goods trains to and from goods stations—9
(8) Transfers to and from goods station and Kingsland Road sidings—12

The whole of the traffic was kept working throughout the six years during which the station was under reconstruction. A description of the engineering work was given in THE RAILWAY GAZETTE supplement of December 8, 1933. Generally speaking, this work can be divided into two main parts, namely:—

(1) Building platforms 1 to 6, with the associated bridge work and permanent way
(2) Reconstruction of old part of station forming platforms 7 to 11

The first part of the work involved the construction by the Signal Department of three temporary mechanical signal-boxes at Pylle Hill Junction, Bristol West, and South Wales Junction, of 160, 80, and 158 levers respectively, working in conjunction with the old East signal-box of 105 levers. This stage of the work was reached about the end of 1933, after about 24 stages in permanent way alterations. The site for the new East box was cleared at this time and sufficient of the bank of the cutting on the west side of the Bath Road bridge excavated to enable the new West box to be erected.

After this date a further 47 stages were carried out until the completion of the permanent way on May 26, 1935, on which day the West power box was opened. On December 10, 1934, as already stated, the Loco Yard box had been opened, and presented a very simple stage in the work.

The opening of the West box, however, introduced a few problems. First of all the permanent way was not complete, since Platform 4 line and the Down Middle line were not in use, and certain point fittings leading to them at each end of the station were not in place. Secondly, the temporary Pylle Hill Junction and Bristol West boxes were so placed that some parts of the siding and an associated number of points in front of the new West box could not be laid until these temporary boxes were removed. Thirdly, the nature of the temporary interlockings did not admit of dividing the responsibility of the signalmen during the changeover to power operation, it being remembered that all the remaining points were being worked manually from the temporary boxes.

For some weeks previous to the opening, possessions of the mechanically worked points had been obtained for the purpose of fitting up the power point connections where possible, parts of the fittings being adapted for mechanical working temporarily. On most points, however, the point machine connections had to be removed after trying out the points and the mechanical fittings restored. All light signals were tested, and where possible track circuits were connected up. In order to do this, the mechanical point fittings were insulated when installed. In many cases temporary track circuits were in use in place of facing point lock bars and no tests could be made with these sections. A very considerable amount of temporary rail joint insulations and bonds was in use.

After a meeting of all three departments concerned, it was decided to disconnect all points and work the whole yard on the ground, flagging all trains. About 120 groundsmen were provided by the Traffic Department for working two 12-hour shifts. These worked in gangs of about six each under the charge of a foreman who was responsible to the signalman in charge. This enabled the following programme to be worked to:—

(*a*) Beginning at 12 midnight on Saturday, May 25, the block telegraph and telephone connections were transferred to the new box. This was completed at about 12.30 a.m. on May 26. Simultaneously three gangs (above 30 men) of Signal Department fitters began disconnecting the points and signals. Another gang of ten men with a 10-ton steam crane began the work of taking down the semaphore signals and loading them into wagons.

Two gangs of locking fitters began the work of dismantling the locking frames in the two temporary mechanical boxes while a further gang of locking fitters was employed at South Wales Junction and Bristol East mechanical boxes carrying out the alterations to locking due to the change of permanent way to be made. A small gang of signal fitters began the necessary disconnections required at South Wales junction. The power was switched on at the West box and all the light signals uncovered.

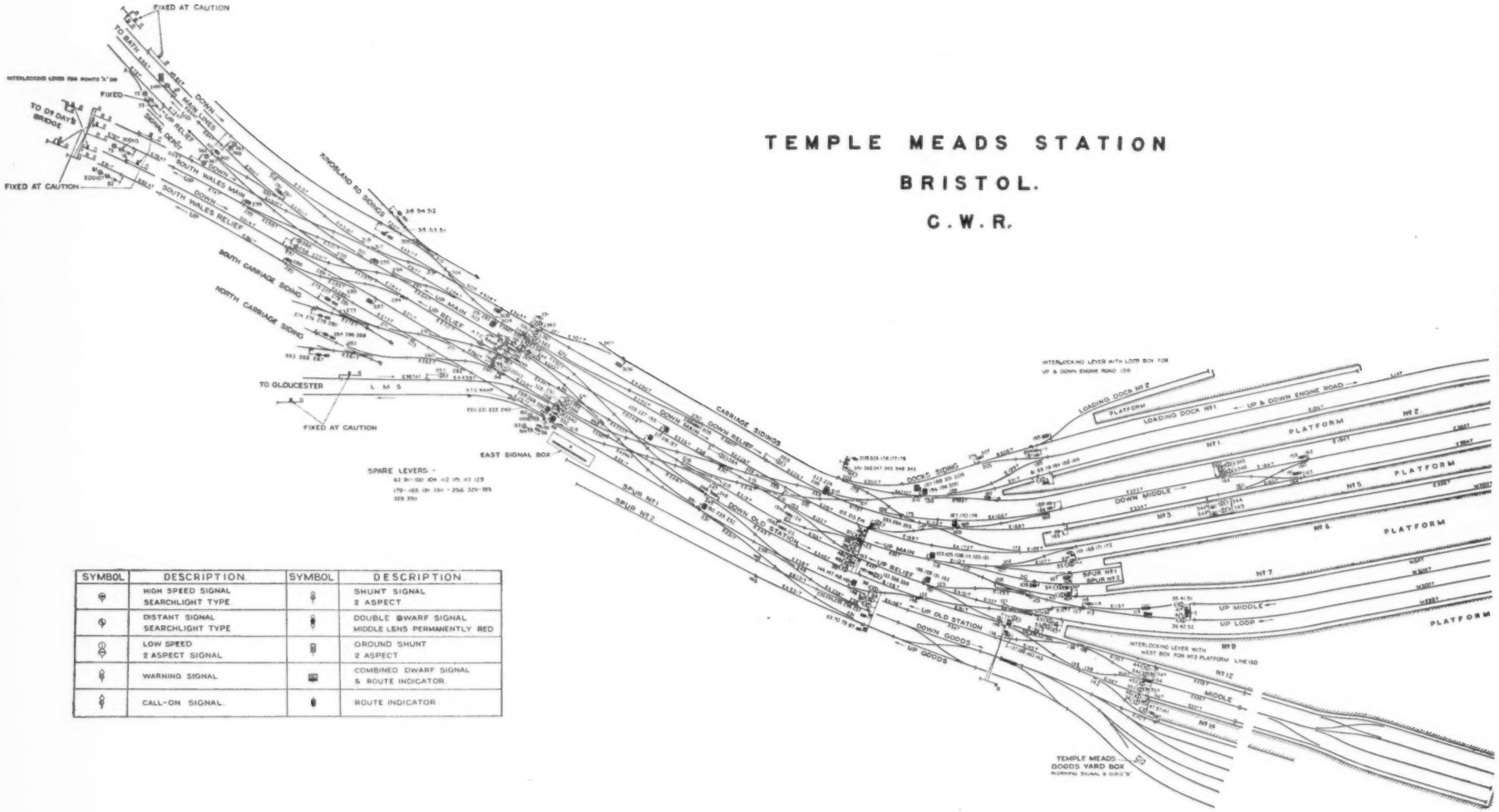
(*b*) At 6 a.m. a further set of signal fitters began connecting up the point machines and track circuits. Permanent way gangs began altering the point fittings at the end of Platform 4.

At 7 p.m. work was finished for the day, and by then the whole of the semaphore signals had been removed and all mechanical rodding and facing lock bars disconnected. All the track circuits were working and the points in the avoiding lines and the double ladder connecting Pylle Hill goods depot with the avoiding lines were connected to the power box. In addition the rearrangement of the permanent way at the east and west ends of Platforms 1 to 4 was completed. No work was done at night except for alterations to locking at South Wales Junction.

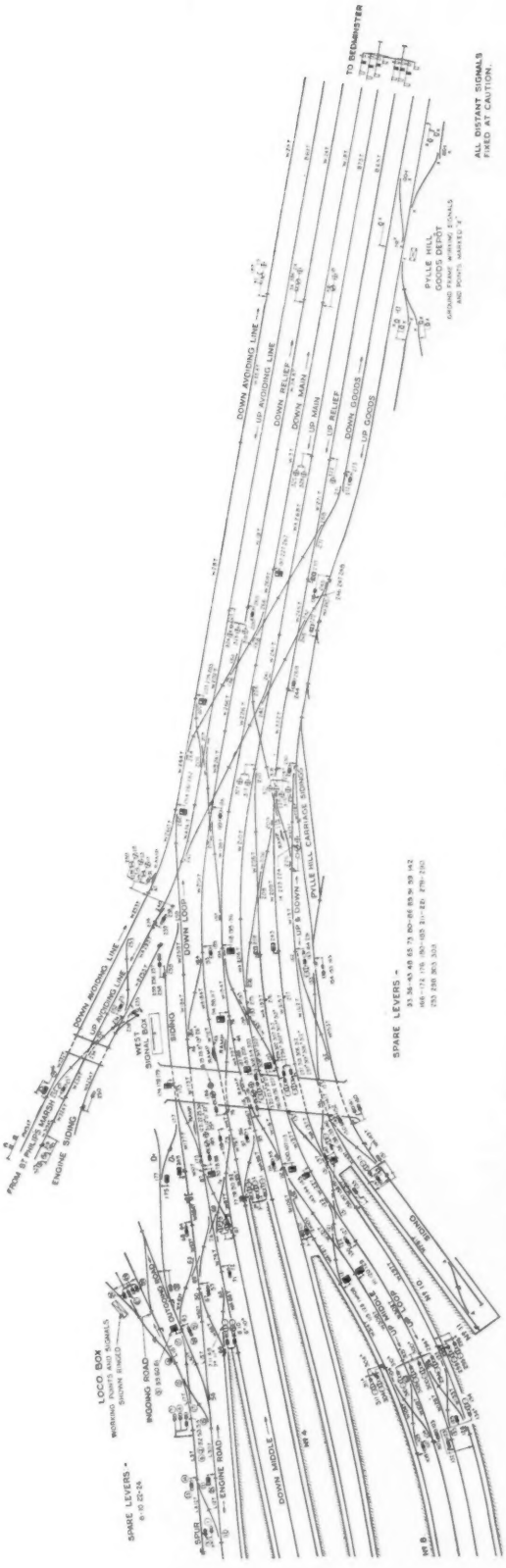
Work was resumed at 7 a.m. on Monday, and by 7 p.m. all the points except the scissors crossovers and the ladder

* THE RAILWAY GAZETTE, May 31, 1935.

TEMPLE MEADS STATION
BRISTOL.
C.W.R.



SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	HIGH SPEED SIGNAL SEARCHLIGHT TYPE		SHUNT SIGNAL 2 ASPECT
	DISTANT SIGNAL SEARCHLIGHT TYPE		DOUBLE DWARF SIGNAL MIDDLE LENS PERMANENTLY RED
	LOW SPEED 2 ASPECT SIGNAL		GROUND SHUNT 2 ASPECT
	WARNING SIGNAL		COMBINED DWARF SIGNAL & ROUTE INDICATOR
	CALL-ON SIGNAL		ROUTE INDICATOR



Signal and track diagram showing the new arrangements at Temple Meads, Bristol, G.W.R. and L.M.S.R. Joint station

at the west end of Platforms 7 and 10 had been coupled up. By midday on Tuesday, May 28, all the points had been coupled up with the exception of the four which had to be laid in on the site occupied by the two temporary boxes. These temporary boxes were dismantled during the following week and the remainder of the permanent way laid in and the points coupled up on Sunday, January 2.

This changeover saw the completion of all the permanent way alterations. The methods adopted for this occupation proved so successful that it was decided to carry out a similar programme at the East End.

Before the beginning of work on November 24 a meeting was held to decide the order in which the points should be connected up, and, in addition, since there was about twice the amount of material to be loaded up, two ballast trains and two steam cranes were required and a traffic programme had to be worked to with these trains. One train was to work on the up and down old station lines and the other on the down main and relief lines.

One of the most important points in connection with this changeover was the arrangements for feeding the goods station and it was decided that the points in the two lines known as the up and down old station lines should be made available for working the goods traffic on Sunday, November 24, and Monday, November 25, on which days the traffic is a minimum. In addition about 77 local passenger trains into Temple Meads station were cancelled. The programme was then as follows:—

(*a*) Sunday, November 24, 12.1 a.m. to 6 p.m.: All semaphore signals were removed and old Bristol East box locking frame was taken out and removed, Bristol old station being closed until 6 p.m.

The block telegraph and telephones were changed over at midnight November 23-24, and traffic was directed from the new East box from this time onwards.

Disconnecting the mechanical points was begun at the same time, and the whole yard was worked on the ground. About 75 groundmen were brought on duty for this purpose. A relief set of 75 groundmen was brought on duty in the afternoon, and worked in the same way as when the West box was being brought into use. Coupling up the point machines was begun at 6 a.m. About 100 Signal Department men were involved in the work.

By 6 p.m. the progress was slightly ahead of schedule and work was finished for the day. All semaphore signals had been removed. Temporary floodlighting was provided for facilitating the groundmen's work at night.

(*b*) Work was resumed on the Monday at 6 a.m. and continued until 6 p.m. A similar period was worked on the Tuesday, and by Wednesday midday the whole of the yard was coupled up.

Some time before either box was opened, a printed notice showing the track and signal layout was issued to all Traffic and Locomotive Department men concerned, giving a description and drawing of all the signals in the yard. To the signalmen chosen to operate the signal-boxes were issued numbered diagrams of the interlocking, and they were given about three weeks' practice with the locking frames just prior to the opening of the box in which to learn the manipulation of the frame. Temporary wiring was installed to free all track locking on point levers. Great credit is due to the signalmen for the efficient way in which they manipulated the frames and block telegraph apparatus from the moment they began actual operations from the new boxes.

The whole of the alterations were the subject of fortnightly meetings between representatives of all departments, at which all stages of the work were discussed and progress reviewed. This process extended over a period of about six years.

The contractor for the power signalling equipment was the General Railway Signal Co. Ltd., and the firm completed its portion of the work in about eighteen months. Callenders' Cable & Construction Co. Ltd. was the sub-contractor for the extensive cabling equipment.

A NEW SIX-WHEELED RAIL PASSENGER CAR FOR PERU

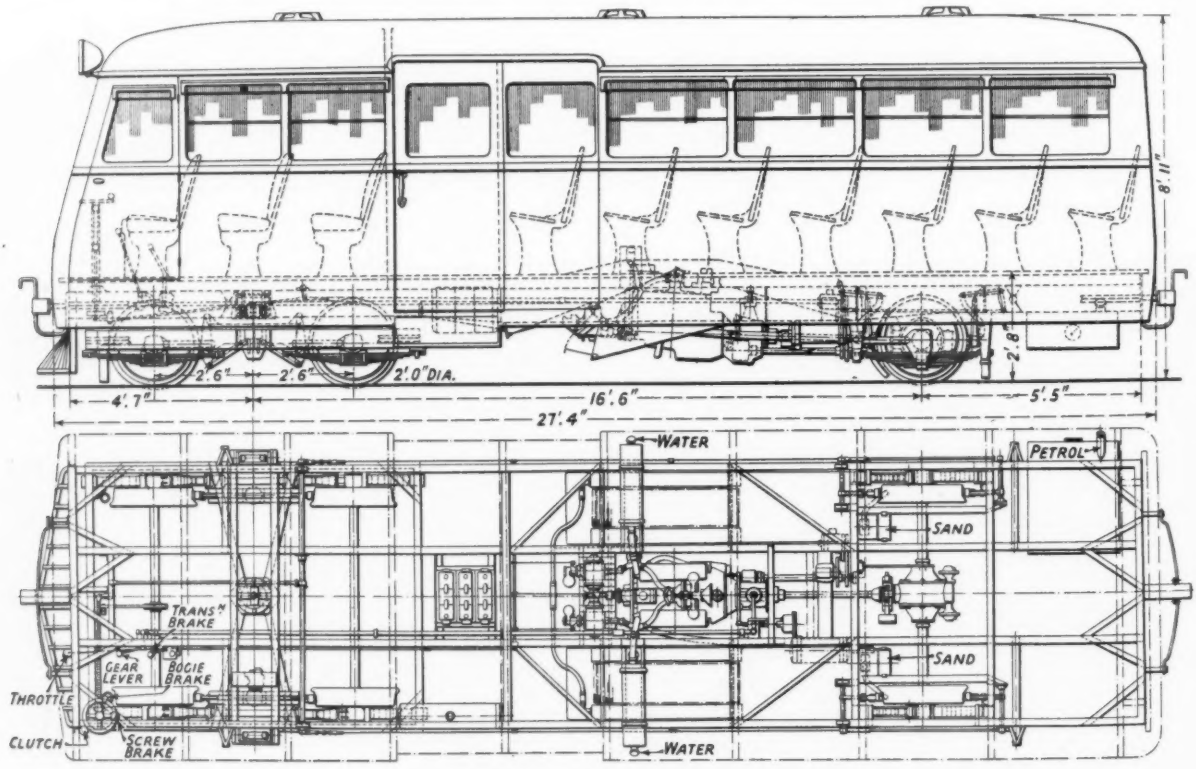
Built by D. Wickham & Co. Ltd., of Ware, and recently tested on the L.N.E.R.

WE illustrate herewith a 40-seater six-wheeled passenger railcar built for the Peruvian Corporation by D. Wickham & Co. Ltd. of Ware, under the supervision of the Consulting Engineers, Messrs. Livesey & Henderson. The vehicle has been designed to operate at altitudes of from 8,000 to 15,000 ft. above sea level, and to climb grades up to 4 per cent. To provide inexpensively for such service conditions required considerable thought and experience, and the solution adopted by the makers is an interesting one.

A Ford V.8 engine drives through a four-speed gearbox to a single axle at the trailing end of the vehicle, which has a bevel and reverse box giving four speeds in each direction. The forward end of the car comprises the first class passenger and driver's compartments, which are carried by a four-wheeled bogie. The engine is supercharged so as to reproduce sea level conditions at a height of 10,000 ft. The power/weight ratio has been kept high, the weight of the vehicle in running order being under six tons. In order to minimise weight the chassis is a light section electrically welded steel frame weighing only 8½ cwt., whilst Accles & Pollock light steel framework is used for the body. The larger part of the seating accommodation is for third class passengers, thirty of whom are carried. The first class compartment seats ten passengers, and the car is always driven from that end. The passenger accommodation is most comfortable, and thanks to ample window spacing the outlook from the vehicle is all that can be desired. The car has electric lighting, and Airvac ventilators are fitted in the roof. Compressed air braking is provided to all six wheels.

The body is panelled outside with sheet steel and lined inside with plywood, that in the first class compartment being faced with mahogany. Central sliding doors on each side give access direct to the third class compartment, and to the first class through a sliding door in the dividing partition. All seats are tubular framed; the first class are upholstered with leather, and the third class fitted with slatted oak seat and back rests. An emergency door is fitted at the rear, this door supporting a fold-up seat. Switches in the driver's compartment control the interior lighting, which is supplied by its own dynamo and battery, independent of the dynamo supplying current for engine operation, head and tail lights. The side windows are of the Quicktho half drop type, and fitted with top outside glass louvres, which in combination with Airvac ventilators in the roof, afford efficient ventilation in wet weather.

The wheels are 24 in. diameter and fitted with renewable rolled steel tyres shrunk and locked on to fabricated steel centres, the latter fitted with fibre pads to reduce noise. The axles are of Brown Bayley's Impacta steel, running in fabricated steel axleboxes fitted with S.K.F. self-aligning roller bearings; no horn plates are fitted, the driving and braking stresses being transferred to the frame by means of fabricated steel radius bars having Silentbloc bushes at each end. The springs are of the semi-elliptical



General arrangements of new Wickham railcar for Peru

The Peruvian railcar on test in England

type underslung to the axleboxes, and their ends carry steel rocking pads bearing on renewable gunmetal bearer plates.

The bogie pivot is of novel construction, being fitted with four large diameter rubber cylinders compressed between a star-shaped casting mounted on the underframe, and a split outer casing fitted to the bogie; the star casting can move vertically on a square section pin fixed to the underframe. No weight is taken on this pivot, and deflection of the bogie can take place only through distortion of the rubber cylinders. The maximum movement, being a matter of a few degrees, does not overstress the rubber. The weight is taken on two side brackets on the frame fitted with renewable gunmetal pads; the springs, eight in all, are of the helical type. The success of this type of mounting was proved during the trials by the exceptionally smooth riding.

Trials were run with this car on the London & North Eastern Railway between Hertford and Broxbourne recently, and although these trials could not be said to resemble the actual service conditions, a speed of 50 m.p.h. was easily maintained on the straight sections without using the superchargers or forcing the engine; which had still to be run in; the petrol consumption worked out at 14 miles a gallon. It was found that the car ran very steadily at all speeds both on the straight and over points and crossings, and demonstrated the fact that smooth riding can be obtained with extremely light vehicles. There was also an entire absence of vibration and rattle.

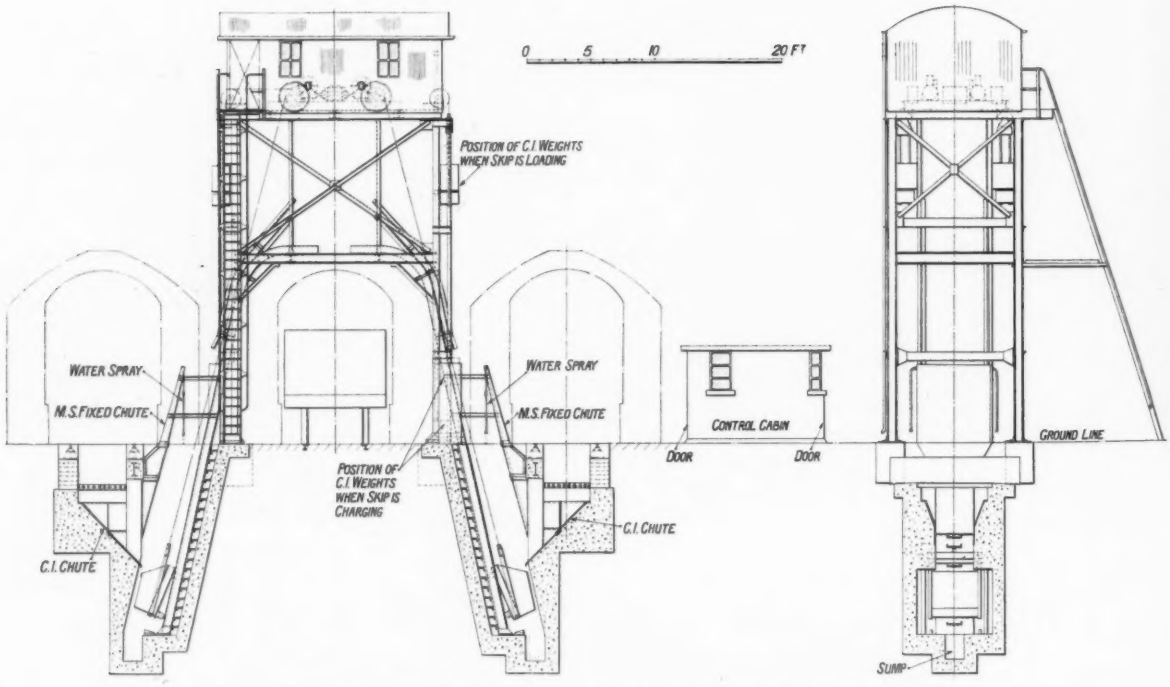
In spite of the fact that the first class compartment is placed immediately over the bogie, the riding here as well as in the main compartment was found to be in all respects satisfactory. The makers inform us that the performance generally was so striking that the Peruvian Corporation, immediately after the tests, placed an order with the builders for a second vehicle identical with the one illustrated, whilst a further order has been received for two vehicles of a somewhat similar kind from the Assam Railways & Trading Company.

Those present at the trials included Sir Brodie Henderson, Mr. Neil Henderson, Messrs. Cooper and Cecil of the Peruvian Corporation, Mr. J. E. Sharpe, Assistant Superintendent (Eastern Section), L.N.E.R., and other railway officials.

Interior of the new Wickham railcar for Peru

General view of double plant

Separate view of single plant



The combined plants shown in part sectional elevation

MECHANICAL ASH-HANDLING PLANT AT DERBY, L.M.S.R.

(See article at top of opposite page)

MECHANICAL ASH-HANDLING PLANT AT DERBY, L.M.S.R.

Installation of Babcock & Wilcox equipment

(*See illustrations opposite*)

IN pursuance of the L.M.S.R. policy of modernising locomotive depôts, mechanical equipment for the expeditious handling of locomotive ashes has recently been installed by Babcock & Wilcox Limited at the Derby motive power depôt. A comparatively large number of engines has to be dealt with daily at this point, and it was therefore decided to equip three pits, two parallel and set at 36 ft. 4 in. road centres with a wagon road between, and a further pit at an angle to the others. Due to site conditions, double and single plants respectively were therefore installed.

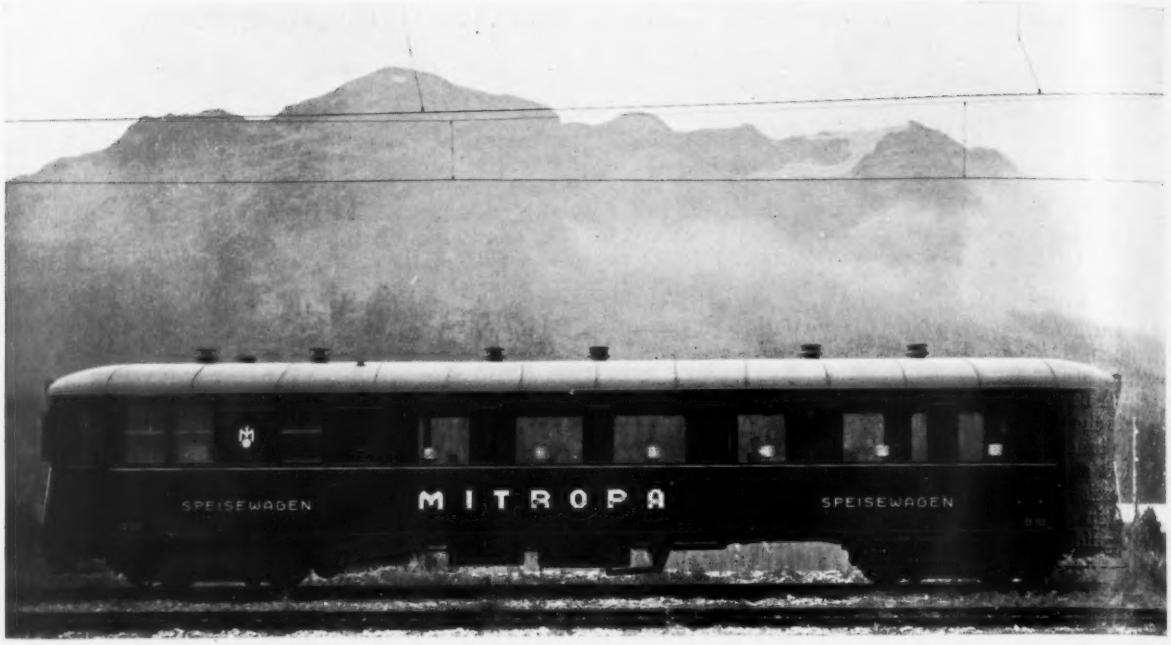
As will be seen from the accompanying illustrations, the part of the plant above ground is of structural steel, suitably braced, and covered in at the top with Robertson's protected sheeting to form a winch house. The foundations consist of a concrete pit 17 ft. 6 in. deep, so formed that a skip of 10-12 cwt. capacity can run down channel-section guides and stop under the outlet point from two chutes. One of these chutes is situated in the ashpit under the engine and deals with the ashes which are raked out from the ashpan, whilst the other chute, arranged between the ashpit road and the structure, and reaching to 6 ft. above rail level, is for dealing with the ashes which are lifted or paddled out through the firehole door and thrown over the side of the engine. Water sprays are fitted to the chutes to quench the hot ash.

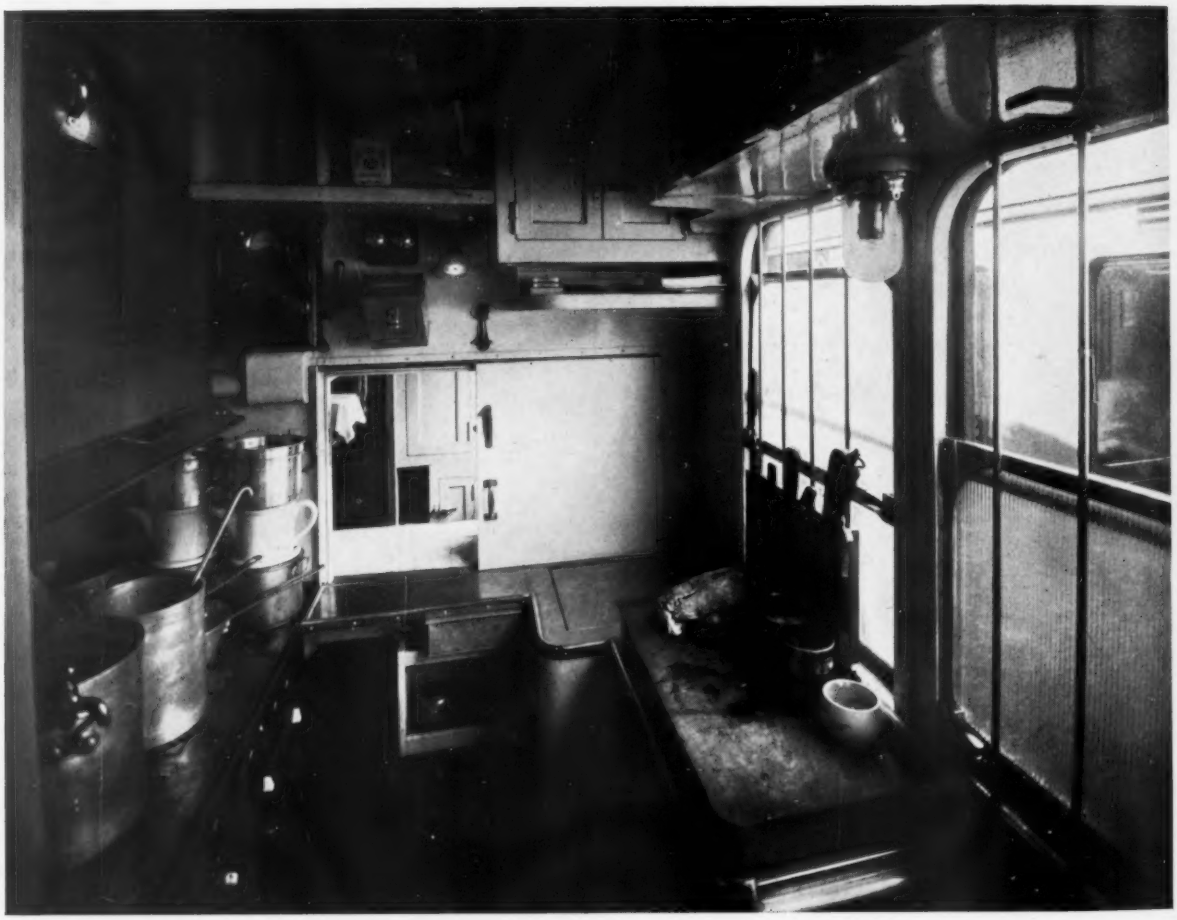
When the skip is full, a control switch situated in the cabin adjacent to the plant is moved from the stop and reset position to the start position, whereupon a 3-h.p. motor is started and hoists the skip, which at the top of its travel is tipped to discharge its load of ashes into a railway wagon on the wagon road. After a pause to complete the discharge, the motor reverses, and the skip is lowered ready for the next load. The whole of the operation is carried out automatically after starting. A balance weight is provided, equal to the weight of the skip plus half a skip-load of wet ashes. This allows a smaller motor to be used.

THE EXTENDED WESTINGHOUSE WORKS AT CHIPPENHAM

OUR illustration shows the extended and modernised works at Chippenham of the Westinghouse Brake & Signal Co. Ltd. The premises cover 13 acres, and are situated close to Chippenham station, G.W.R., with siding accommodation communicating with the railway. In this factory are now produced power and mechanical signalling plant; compressed air, electro-pneumatic, and vacuum brakes for railways; air compressors; steam heating; air and vacuum brakes for road vehicles; power decking and air lock control plant for collieries; and metal rectifiers in large numbers of all sizes from radio types to big industrial installations for electro-plating, &c.

All machinery is electrically driven, deriving its supply from the factory sub-station which transforms the 11,000-V., 50-cycle, 3-phase input from the National Grid to 400 V., 50 cycles, 3-phase. The equipment of the factory provides for the handling from start to finish of all the varied range of products supplied. The largest single department is the foundry, which, with the ferrous and non-ferrous sections, pattern shops, stores, &c., covers an area of 75,000 sq. ft. The assembly shops for brake and signalling apparatus are 56,600 sq. ft. in area, and those for electrical products 28,080 sq. ft. Other departments include the metal rectifier shop (29,000 sq. ft.), the Bakelite shop (2,500 sq. ft.), and the electrical and brake test rooms, together totalling 9,400 sq. ft. The total number of employees engaged in the extended and re-organised factory is approximately 2,150.





New metre-gauge electric dining car, Rhaetian Railway, showing (below) the kitchen equipment
(See article at top of opposite page)

RHAETIAN RAILWAY ELECTRIC DINING AND KITCHEN CAR

This type of car, running on an electrically-operated metre gauge railway, has points of special interest

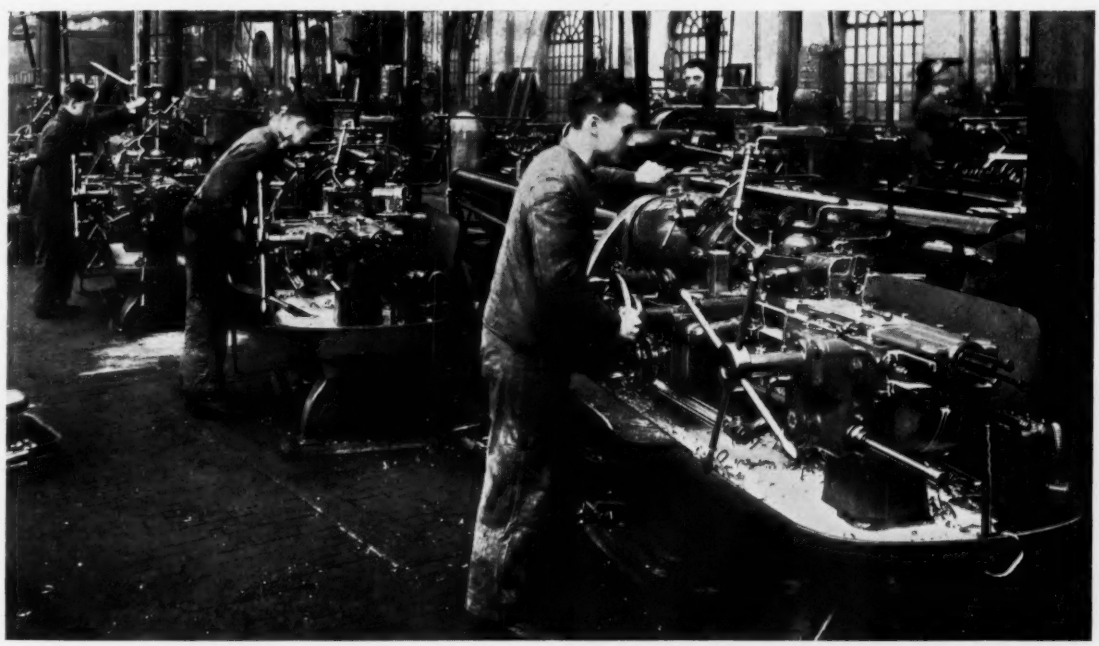
(See illustrations on opposite page)

THREE 26-ton combined dining and kitchen cars have recently been built for the Rhaetian Railway in Switzerland by the Schweizerische Wagon-Fabrik, Sclieren-Zurich, for service between Chur and St. Moritz (Engadine). The kitchen equipment, which is all-electric, was supplied by Therma Fabrik für elektrische Heizung A.G., Schwanden, Switzerland, and includes a range, boiler, and warming plate, the total output being 20 kW., as well as plug sockets; control is by three-position switches.

Although the use of electricity is convenient, it entails certain difficulties, such as variation in the contact-line voltage and the necessity of collecting current through an electric locomotive (which is not always available when standing at a station). The former is overcome by the fitting of an automatic transformer with two regulating steps, and the latter by the installation of station plug points and heating transformers. At Chur pre-heating equipment was previously in use, with 10 terminals for connecting up with the train heating cables, and a similar plant is now installed at St. Moritz. Also two smaller ones have been put in at intermediate stations.

PRODUCING BOLTS FROM MILD STEEL BARS*

Installation of Ward single-pulley headstock capstan lathes at Crewe works, L.M.S.R.

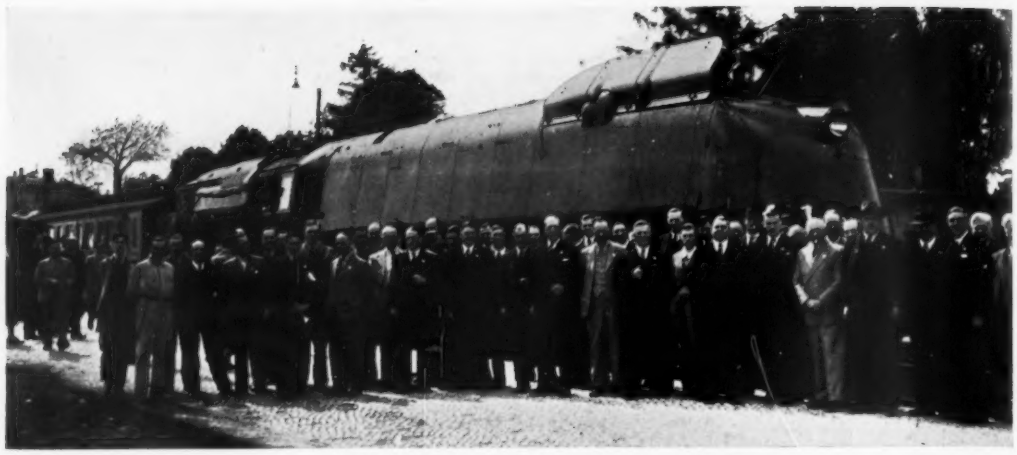


THE accompanying illustration shows a group of Ward No. 7 capstan lathes recently installed at the Crewe works of the London Midland & Scottish Railway. These machines are engaged on the manufacture of bolts, ranging from $\frac{7}{8}$ in. to $1\frac{1}{8}$ in. diameter, from mild steel bars, and they are seen producing hexagon headed bolts $1\frac{1}{8}$ in. diameter by 5 in. long, threaded for $1\frac{1}{2}$ in. The production time on this work is 10 bolts an hour, with a turning speed of 92 ft. per min. and a feed of 93 cuts per in., screwing at 37 r.p.m. High speed steel 18 per cent. tungsten tools are used.

These machines are of the latest single-pulley headstock type, and are fitted with an automatic air-operated bar chuck having an inclined control block, as well as the new type bar feed motion and electric suds pump. There are six forward and six reverse spindle speeds, the range of which, when the lathe is driven direct from the mainshaft of a single speed motor, is from 42 to 1,650 r.p.m.

It is of interest that the maximum diameter which will swing over the bed of the machine is 1 ft. $1\frac{1}{8}$ in. The speed groups are suitable for the widest possible range of work, and ball and roller bearings are used for the shafts in the headstock, while all gear teeth are accurately form ground.

* Illustration reproduced, together with the accompanying particulars, by courtesy of Mr. W. A. Stanier, Chief Mechanical Engineer, L.M.S.R.



Streamlined 4-6-4 locomotive, German State Railway, at Ludwigslust on special run with Institution of Locomotive Engineers' party (*see page* 1132)

Left : The special train at Wittenberge Right : Electric observation car conveying Institution of Locomotive Engineers' party to Garmisch ; Dr. Wagner standing on right

A group of those who attended the summer meeting of the Institution of Mechanical Engineers at York. In the centre are Mr. H. N. Gresley with the Lord Mayor and the Sheriff of York

Photo] [Yorkshire Herald

RAILWAY NEWS SECTION

PERSONAL

Mr. Oswald Pirow, K.C., South African Minister for Railways, Harbours and Defence, arrived in London from Cape Town on June 8, to discuss with the British Government problems of transport and defence. The Secretary for the Dominions, Secretary of the Committee of Imperial Defence and representatives of the Admiralty and War Office met him at Waterloo.

L.N.E.R. APPOINTMENTS

The following London & North Eastern Railway appointments have been made:—

Mr. L. E. Marr, District Passenger Manager, York, to be District Goods Manager, Middlesbrough, in succession to Mr. W. E. Blakey, recently appointed Assistant Goods Manager, North Eastern Area.

Mr. A. S. Buswell, Assistant District Superintendent, Manchester, to be District Passenger Manager, York, in succession to Mr. Marr.

Mr. L. Sproat, Assistant to Superintendent (Trains), North Eastern Area, to be District Superintendent, York, in succession to Mr. T. H. Royle, who will shortly retire from the service.

Mr. J. R. Sadler, Assistant District Superintendent, York, to be Assistant to Superintendent (Trains), North Eastern Area, in succession to Mr. Sproat.

Mr. E. W. I. Arkle, Assistant District Superintendent, Newcastle, to be District Passenger Manager, Newcastle, in succession to Mr. E. F. Wilkinson, who will shortly retire from the service.

Mr. A. Moss, Signal and Telegraph Assistant, Engineer's office, Edinburgh, to be Signal and Telegraph Engineer, Scottish Area.

We regret to note the death, on June 8, at Mülhouse, Alsace, of Monsieur Alfred George de Glehn, the famous locomotive engineer whose name is associated with the system of compounding used so successfully on many of the French railways and those of other countries for the past 40 years. The remarkable efficiency of engines built on this system, and their ability to start smoothly, haul heavy loads at uniformly high speeds, and "anihilate" gradients, established an international reputation second to none.

Mr. H. N. Gresley, C.B.E., D.Sc., M.Inst.C.E., M.I.Mech.E., M.I.E.E., M.Inst.T., Chief Mechanical Engineer, London & North Eastern Railway, who is President of the Institution of Mechanical Engineers during the current year, has been presiding at the Summer Meeting of that institution held at York this week, June 8—12. Mr. Gresley was educated at Marlborough and began his railway career at Crewe works, L.N.W.R., where he served his apprenticeship under the late Mr. F. W. Webb. He was subsequently a pupil under Mr. (now Sir) John Aspinall at Horwich, Lancashire & Yorkshire Railway, and after varied experience was placed in charge of the test room at those shops. He was next appointed Foreman of the two locomotive sheds at Blackpool, and subsequently became Outdoor Assistant in the Carriage and Wagon Department. In 1901 he was posted as Assistant Works Manager at Newton Heath, was promoted Manager in the following year, and Assistant Superintendent of the department in 1904. A year later Mr. Gresley transferred his services to the former Great Northern Railway as Carriage and Wagon Superintendent, which position he held until 1911, when he succeeded Mr. Ivatt as Locomotive Engineer at Doncaster. During his tenure of this office he did much to maintain the locomotive and rolling stock standards of the line in the forefront of British practice, and, by introducing his articulated bogie principle for coaching stock, as well as improved locomotive designs, ensured greater economy and improved efficiency. In 1923 he was appointed Chief Mechanical Engineer of the L.N.E.R., and has continued the policy of advance, his name being identified largely with locomotives of the three-cylinder single expansion type having large superheated boilers with liberal grate areas and fireboxes. Among Mr. Gresley's most outstanding designs may be mentioned the 2-8-2 "Cock o' the North" express passenger and the Super-Pacific types, including the streamlined engines for the Silver Jubilee train. During the meeting members of the institution were also introduced to his new types now under construction or just completed at Doncaster shops. Mr. Gresley, as well as being a Member of the Institution of Mechanical Engineers, is also a Member of the Institutions of Civil and Locomotive Engineers, of which latter he was President for the second time in 1934. He is an honorary D.Sc. of Manchester University, and a Major in the Engineer & Railway Staff Corps. For special services rendered during the war he received the honour of C.B.E.

Photo by [*Lemare*

Mr. H. N. Gresley, C.B.E., D.Sc.,
Chief Mechanical Engineer, L.N.E.R., and President of the Institution of Mechanical Engineers, 1936-37

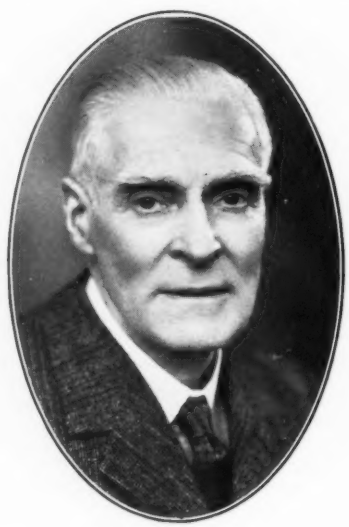
Mr. T. B. Cox, who, as announced in our issue of June 5, has retired from the position of Assistant Accountant, Great Western Railway, after completing over 50 years' service, spent the whole of this period in the audit section of the Chief Accountant's office, styled the audit office prior to January, 1920. He thus holds the record for long service in the audit section. When he commenced his railway career in 1886, it was as an entrant to the ticket department, and in 1896 he was transferred to the agreements department, of which he became head in 1917. In 1922, Mr. Cox was appointed Principal Clerk in the audit section, and Assistant to the Chief Accountant in 1925; he became Assistant Accountant in

1934, and has been responsible to the Chief Accountant for the audit section for some years. He was prominently associated with the settlement of problems affecting the audit section, which arose from the control of the railway by the Government during the war period, also those caused by the amalgamations under the Railways Act, 1921, and the very considerable changes in connection with the "Appointed Day," January 1, 1928. The amalgamations in 1922-23 necessitated the unification of the many arrangements existing between the various units forming the new Great Western and London Midland & Scottish Companies. These arrangements had been set up between the particular units party to them in furtherance of their particular interests, and it was impossible in the new group circumstances to continue to honour many of them. A broad view had to be taken of the situation, but it was also necessary to ensure that prejudice should not result to either amalgamated company from the cancellation of the arrangements, and the task was one of much complexity. Mr. Cox was appointed chairman of the sub-committee which was set up by the two companies' officers to formulate a scheme of unification, and was the author of the original draft forming the basis of the work of the sub-committee, which extended over several years. He also acted as secretary to the committee of officers dealing with this and allied matters for about ten years. The institution and operation of the Railway Freight Rebates Scheme and the London Passenger Transport Pool are other matters which have received his close attention. When the new comprehensive pools of competitive traffic receipts with the L.M.S. and L.N.E. Companies were proposed, a large share of the initial work on the Great Western side fell on Mr. Cox, and he has taken a very active part in the onerous task of carrying out the provisions of the pooling agreements following their approval by the Minister of Transport. His unfailing courtesy and his readiness to place his wide knowledge and experience at the disposal of all, have made him one of the most valued and popular officers at Paddington. His duties have for many years brought him in close touch with the principals and staff of most of the other headquarters offices of the company, and with representatives of the other British railways and the Railway Clearing House, from whom he has received many expressions of goodwill.

Elliott [*& Fry*

Mr. T. B. Cox,

Assistant Accountant, Great Western Railway, 1934-36



Mr. E. K. Carey,

District Locomotive Superintendent, Sheffield, L.M.S.R., 1928-36

Mr. W. J. R. Squance,

Appointed General Secretary, Associated Society of Locomotive Engineers and Firemen

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Mr. E. K. Carey, who is retiring at the end of July from the position of District Locomotive Superintendent, Sheffield, L.M.S.R., was born in 1871. After having served his time as a pupil of Jessop & Appleby, steam crane and engine builders, at Leicester, he entered the service of the former Midland Railway in the Hydraulic Department at Leicester, where he was employed for three years. He was then transferred to Nottingham and spent six years in the locomotive shops and running sheds. In 1900 he was given the post of Foreman Fitter at Buxton, and four years later he was appointed to the position of Locomotive Superintendent to the former Tralee & Dingle Railway, a narrow gauge line in County Kerry, Ireland. Returning to the Midland Railway in 1907, Mr. Carey was appointed Assistant to the District Locomotive Superintendent at Derby, and shortly afterwards was given charge of the Birmingham District for two years. It was in September, 1911, that Mr. Carey took over the post of District Locomotive Superintendent at Carlisle, where he remained until March, 1928, when he was appointed to the Sheffield District, whence he is now retiring. Mr. Carey is a member of the Institution of Locomotive Engineers.

Mr. W. J. R. Squance, who, as announced in THE RAILWAY GAZETTE of May 29, has been appointed General Secretary of the Associated Society of Locomotive Engineers and Firemen, in succession to Mr. J. Bromley, was born on January 1, 1880, at Landore (Swansea), where he joined the Great Western Railway as a cleaner in 1894, and was appointed as a fireman in 1898. He was promoted to be a driver at Goodwick in 1907, joined the Aberdare Branch of the A.S.L.E. & F. in 1899, and became Secretary of the Goodwick Branch in 1907. Three years later he was elected Chairman of the Newport Branch and from 1911-16 served as Secretary of the Llanelly Branch, having been a delegate to the Cardiff and Newport Conferences in 1908. In 1915, Mr. Squance was appointed to be the first Secretary of the G.W.R., Delegation Board, and as a member of the Executive Committee of the South Wales District in the following year. In the years 1919 and 1921 he was elected Vice-President and President of the Executive Committee, and was a member of the Negotiating Sub-Committee for National Negotiations and of the National Wages Board, 1920 and 1928. He was Secretary, Employees' Side, Great Central, North Staffordshire and L.N.E. Railways, Sectional Railway Council No. 2 and of Great Northern (Ireland), S.R.C. No. 3, and since 1921 has been connected with the Irish national negotiations, and the society's advocate on all wages claims in Ireland. Mr. Squance left the G.W.R. in July, 1921, becoming Organising Secretary of

the union in the following month, and Assistant General Secretary in 1927, the position he vacates on July 16 to become General Secretary. He was advocate, National Wages Board, on several important cases between 1927 and 1934, and was adopted as prospective parliamentary candidate for the Bassetlaw Division in 1932, but resigned in the following year due to the A.A.D. decision upon officers holding dual positions.

Sir George Sutherland has resigned from the board of the Bengal & North Western Railway, which has elected Lt.-Col. A. H. C. Sutherland to fill the vacancy so formed.

The election of Mr. H. C. Drayton as a Director of the Antofagasta (Chili) & Bolivia Railway was confirmed at the ordinary general meeting of the company held in London on June 9.

Mr. Ivon Tuxford, M.Inst.C.E., Engineer-in-Chief of the Nanking-Shanghai and Shanghai-Hangchow-Ningpo Railways, has just arrived in England on leave, and will be returning to China in about four months' time.

INSTITUTE OF TRANSPORT

The following member and associate member were elected during May:—

Member

Mr. F. E. M. Beatley, General Manager and Traffic Manager, Sierra Leone Government Railways.

Associate Member

Mr. F. J. Wymer, Divisional Marine Manager, Dover, Southern Railway.

In connection with the identification of the interests of Associated Locomotive Equipment Limited with those of Caprotti Valve Gears Limited, Mr. F. J. Kuretschka has been appointed Managing Director of both companies.

Meanwhile, Mr. Herman Lindars has resigned from the chairmanship of the former company, which he has held for the past ten years.

Mr. Lindars has been closely connected with the commercial and technical development of poppet valve gears, and there are now large numbers of locomotives running throughout the world equipped with the poppet valve gears marketed by Associated Locomotive Equipment Limited. Mr. Lindars has been connected with several new developments on railways; in particular, it will be remembered, the Froelich rail brake—installed in the marshalling yards at Whitemoor and Hull, also at Naihati in India, and now being extensively used in France—was introduced by a firm of which he was the chairman. We understand that Mr. Lindars is concentrating his activities on matters connected with the coal industry, and has recently been appointed Chairman of the Research Council set up by the Combustion Appliance Makers' Association (Solid Fuel) in conjunction with the Coal Utilisation Council.

INDIAN RAILWAY STAFF CHANGES

Sir James Williamson, Kt., Agent, B. & N.W. and R. & K. Railways, has proceeded on 18½ months' leave preparatory to retirement.

Mr. J. D. Westwood has been appointed to act as Agent, B. & N.W. and R. & K.R. vice Sir James Williamson.

Mr. G. D. Laurie, Chief Auditor, B. & N.W. and R. & K.R., has proceeded on 6½ months' combined leave.

Mr. A. Mair has been appointed to act as Chief Auditor of the B. & N.W. and R. & K.R., vice Mr. G. D. Laurie.

Sir Guillermo E. Leguizamon, K.B.E., Chairman of the Local Committees of the Buenos Ayres Great Southern and Western Railways, has been appointed the first Chairman of the new British-Argentine Railway Committee, composed of the general managers and principal local directors of all British-owned Argentine railways. Its principal object is to safeguard British railway interests in Argentina as a whole, and not as heretofore by the local boards individually.

The funeral of Mr. Felix Fighiera, Secretary of the Central Argentine Railway, whose death we announced last week, took place at Putney Vale Cemetery on June 4. The preliminary service was held at St. Mary's Church, Wimbledon, and was conducted by Canon A. H. Phelips.

The family mourners were Mrs. F. C. C. M. Fighiera (widow) and Mr. Eric Fighiera. Mr. Cyprian G. C. Fighiera (son) is in Argentina.

The Central Argentine Railway was represented by Mr. W. Howard-Williams (Chairman), Lord Forres, Sir W. Guy Granet, Mr. Charles H. Pearson and Mr. W. K. Whigham (Directors), Mr. George W. Cocollis (Assistant Secretary), Mr. Ambrose and Mr. Booker (representing the staff), and Mr. Walter P. Norton (Solicitor).

Others present were:—

Sir Eastman Bell, Lt.-Col. Woodbine Parish, Mr. W. J. Maslen, Mr. H. A. Hicks, Mr. J. T. Dillon, Mr. C. Ellison Rich, Sir Thomas Williams, Sir Follett Holt, Mr. J. M. Eddy and Mr. J. A. Goudge.

A largely attended Memorial Service was also held at the Church of St. Lawrence Jewry-next-Guildhall on June 8, and was conducted by the Rev. A. Lombardini, the Rev. D. Bryant giving an address.

We regret to announce the recent death of Mr. Llewellyn George Henry Wynn-Williams, B.Sc., A.M.Inst.C.E., M.I.Loco.E., Assistant Manager, Dukinfield (Manchester) Carriage and Wagon Works, L.N.E.R., at the age of 33. He graduated at London University and served his apprenticeship first under Sir Vincent Raven and later under Mr. H. N. Gresley, C.M.E., L.N.E.R. His first appointment was as Assistant to the Manager, Faverdale Wagon Works, Darlington, and he subsequently became Assistant Manager at the Cowlairs and the Shildon carriage and wagon works before going to Manchester.

L.M.S.R. APPOINTMENTS

The following appointments have been approved by the directors:—

Chief Commercial and Chief Operating Managers' Departments.

Mr. A. H. Myers, Assistant to District Goods Manager (Cartage), Manchester, to be Goods Agent, Manchester (London Road).

Mr. S. G. Spiller, Goods Agent, Bristol, to be Goods Agent, Leicester.

Mr. C. W. Jones, Goods Agent, Commercial Road, to be Goods Agent, Bristol.

Mr. W. J. Eaton, Goods Agent, Whitecross Street, to be Goods Agent, Commercial Road.

Mr. F. W. Moxon, Chief Cartage Clerk, District Goods and Passenger Manager's office, Sheffield, to be Goods Agent, Rotherham.

Mr. H. A. Sharp, Goods Agent, Tunstall, to be Goods Agent, Longton.

Mr. G. Mitchelhill, Clerk (Goods Revenue section), Chief Commercial Manager's office, Euston, to be Goods Agent, Rochdale.

Mr. J. Inman, Goods Agent, Leeds (Wellington Street), to be Goods Agent, Leeds (Hunslet Lane).

Mr. J. Selman, Chief Clerk, Leeds (Hunslet Lane), to be Goods Agent, Leeds (Wellington Street).

Mr. R. O. Markland, Goods Agent, Bradford (Bridge Street), to be Joint Goods Agent, Halifax.

Mr. V. Oates, Goods Agent, Heckmondwike, to be Goods Agent, Bradford (Bridge Street).

Chief Commercial Manager's Dept.

Mr. F. E. Bailey, Assistant to District Goods Manager, Bolton, to be Sales Assistant, Chief Commercial Manager's office, Euston.

Mr. W. H. Glossop, Clerk (Research Section), Chief Commercial Manager's office, Euston, to be Assistant to District Goods Manager, Bolton.

Chief Operating Manager's Dept.

Mr. L. S. Kettle, Head Office Inspector (Cartage Analysis), Chief Operating Manager's office, Euston, to be Assistant to District Goods Manager (Cartage), Manchester.

Chief Mechanical Engineer's Dept.

Mr. J. T. Tyers, Divisional Inspector, Euston, to be Dist. Foreman, Wigston.

Electrical Engineer's Department.

Mr. R. C. Smith, Draughtsman, Euston, to be Resident Engineer, Birkenhead North.

Scottish Change.

Mr. C. Scott, Engineering Assistant, Divisional Engineer's office, Glasgow, to be Assistant to District Engineer, Perth.

THE FRENCH STRIKES AND RAILWAY SERVICES.—The strike of Wagons-Lits employees in France which, as recorded in our Overseas columns this week, caused the cancellation of the northbound Blue Train on June 7, was settled last Tuesday. Normal sleeping car services were resumed on Wednesday.

The Silver Jubilee, L.N.E.R.

Some details of current locomotive performance on this high-speed service

Standards of locomotive performance hitherto unprecedented in Great Britain are exhibited in the two down journeys on the Silver Jubilee Express of the L.N.E.R. which are tabulated herewith. The first was an unchecked run, apart from the usual service slacks; but the second included a slowing to walking pace for a bridge reconstruction at New Barnet, a severe permanent way relaying check between Newark and Carlton-on-Trent, and an unusual delay by signals, which reduced the speed to 5 m.p.h. at Welwyn Garden City. Careful calculation shows the cost of these three slowings to have been 10 min., all but 3 min. of which were recovered by the locomotive, leaving a net time of 191 min. for the 232·3 miles from King's Cross to Darlington, and a net start-to-stop average of 73 m.p.h. The latter includes, of course, the customary drastic slowings through Peterborough, Selby, and York, and minor slacks at Langley troughs, Offord, Werrington troughs, Grantham, Retford, and Doncaster, all to between 64 and 70 m.p.h. On the second run the 46·4 miles from Stevenage to Fletton Junction were run in 33 min. 52 sec., the 90·3 miles from Werrington Junction to Templehirst in 68 min. 39 sec. (or 65 min. 39 sec. net, allowing for the Carlton relay check), and the 5·5 miles from Riccall to Naburn in 4 min. 2 sec., making a total of 142·2 miles run in 106 min. 33 sec. net, at an average of precisely 80 m.p.h., in this one journey, including the negotiation of both Stoke and Markham summits, the former of which was breasted at a minimum speed of 77½ m.p.h.

On the first run *Silver Fox* maintained 65 m.p.h. throughout up the 1 in 200 to Potter's Bar, and touched 82 m.p.h. at Hatfield; maxima of 90 m.p.h. at Three Counties, and 92½ at Biggleswade, only just sufficed, in view of the 70 m.p.h. reduction enforced over the Offord curves, to keep the 19 min. booking from Hitchin to Huntingdon, which requires an average speed of 85·3 m.p.h. A maximum of 92 m.p.h. was again reached down the 1 in 200 from Abbot's Ripton, so taking the train through Peterborough a minute early. The most remarkable effort of the journey was then made on to Grantham, with a maximum speed of 86½ m.p.h. at Tallington, an average of 81·2 m.p.h from Essendine up to Stoke and a minimum of 77½ on the three final miles at 1 in 178 to the summit. A maximum speed of 85 m.p.h. was reached beyond Hougham, and after passing Newark 2 min. early, the driver eased the engine to Doncaster, which was passed almost exactly on time. After a rapid acceleration to 88½ m.p.h. at Balne, the run had little further of special note, owing to the restricted speed north of York, and Newcastle was reached in 197 min. 27 sec.

Principal interest, however, attaches to the second run, owing to the effort made on the footplate to regain the time lost by the various checks. After climbing the 1 in 105-110 from King's Cross to Holloway, the train passed Finsbury Park, 2·5 miles out, at 54 m.p.h., and Wood Green at 66, afterwards accelerating up the 1 in 200 to 68 m.p.h. before the dead slowing over New Barnet station bridge. From 3 m.p.h. here there was an acceleration up 3½ miles at 1 in 200 to 57½ m.p.h. at Potter's Bar, and from there a further rapid acceleration in just over 5 miles to 86½ m.p.h. beyond Hatfield. Then came the second slowing, prolonged until the train was almost at a stand, for adverse signals at Welwyn Garden City; in 3¼ miles from here, 1¼ level and the remainder at 1 in 200 up, speed had increased to 61½ m.p.h. From Woolmer Green there was further rapid acceleration, to 79 m.p.h. in about 2 miles, followed by a slowing to 68 m.p.h. over Langley troughs. On the down grade beyond, Hitchin was passed at 85 m.p.h.; then 90 m.p.h. continued with momentary slight intermissions to 88, from Three Counties to Sandy, passed at 86½ m.p.h., and was again reached at Tempsford. Over St. Neot's "hump" the minimum was 79 m.p.h., and 86½ m.p.h. was the maximum before the reduction to 70 at Offord. The three miles at 1 in 200 up to Leys reduced speed to 72½ m.p.h., and this was followed by a maximum of 92 at Holme. Net time for the 75 miles, from King's Cross start to Fletton Junction was a few seconds under the even hour. A careful approach was made to Peterborough, which was passed at 25 m.p.h.

From Peterborough the climb to Stoke was even more noteworthy than that of the previous run. Steam was shut off for Werrington troughs, which were cleared at 69 m.p.h. In 5¼ miles of level to Tallington speed rose to 85 m.p.h., and up 1½ miles of 1 in 440, followed by ½-mile level, to 90 m.p.h. before Essendine. From milepost 87¼ to Little Bytham the grades are 1¾ miles at 1 in 264 up, 2 miles mostly level, and 1¼ miles at 1 in 200, at the top of which speed was still 86½ m.p.h.; the remaining 3¼ miles at 1 in 200 up, to milepost 95½, brought it down to 79 m.p.h. Recovering to 80½ on the level 1½ miles through Corby, *Silver Link*

L.N.E.R. Silver Jubilee
Load: 7 cars = 220 tons tare, 230 tons gross

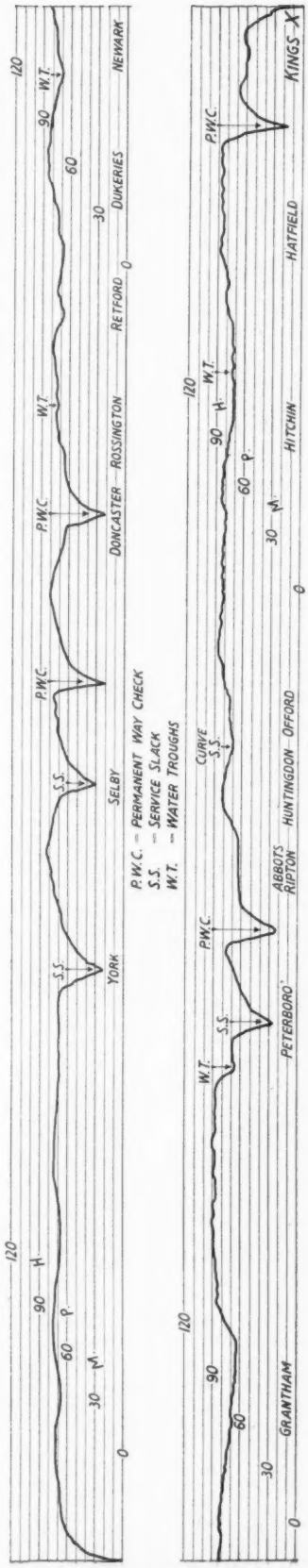
Distance	Engine No. .. .. / .. Name	Schedule	2512 *Silver Fox*	2509 *Silver Link*
miles		min.	min. sec.	min. sec.
0·0	KING'S CROSS	0	0 00	0 00
2·5	FINSBURY PARK	—	5 09	4 50
5·0	Wood Green	—	7 40	7 09
				p.w.s.§
9·2	New Barnet	—	11 31	11 45
12·7	Potter's Bar	—	14 48	16 59
17·7	HATFIELD	18½	18 50	21 00
				sigs.‖
23·5	*Woolmer Green*	—	23 23	28 35
			troughs††	troughs††
28·6	Stevenage	—	27 25	32 58
31·9	HITCHIN	29½	29 53	35 32
37·0	Arlesey	—	33 24	39 03
44·1	Sandy	—	38 08	43 51
51·7	St. Neot's	—	43 25	49 15
58·9	HUNTINGDON	48½	48 57	54 42
63·5	Abbot's Ripton	—	52 37	58 25
69·4	Holme	—	56 30	62 27
75·0	*Fletton Junction*	—	60 38	66 50
76·4	PETERBOROUGH*	63½	62 32	68 53
79·5	*Werrington Junction*	—	66 30	72 38
84·8	Tallington	—	70 38	76 47
88·6	Essendine	—	73 19	79 26
92·2	Little Bytham	—	75 51	81 57
97·1	Corby	—	79 30	85 35
100·1	*Stoke Summit*	—	81 50	87 53
105·5	GRANTHAM	87½	85 52	91 50
111·5	Hougham	—	90 47	96 28
120·1	NEWARK	99½	97 30	102 23
				p.w.s.¶
126·4	Carlton-on-Trent	—	103 07	110 00
133·7	*Markham Summit*	—	109 12	116 20
138·6	RETFORD†	114½	113 10	120 10
143·9	Ranskill	—	117 46	124 33
147·7	Bawtry	—	120 51	127 25
151·3	Rossington	—	124 00	130 11
156·0	DONCASTER†	128½	128 10	134 13
160·2	*Shaftholme Junction*	132½	131 47	137 40
166·0	Balne	—	136 01	141 34
169·8	Templehirst	—	138 40	144 17
174·4	SELBY*	144	142 38	148 05
178·5	Riccall	—	147 23	152 51
184·0	Naburn	—	151 30	156 53
188·2	YORK*	156½	156 06	161 30
193·7	Beningbrough‡	—	162 37	167 35
199·4	Alne‡	167½	167 47	172 15
204·3	Pilmoor‡	—	172 12	176 17
210·4	THIRSK‡	177	177 22	181 23
218·2	NORTHALLERTON‡	184	184 10	188 00
227·1	*Eryholme*‡	192	191 12	195 25
229·7	Croft Spa‡	—	193 23	197 36
232·3	DARLINGTON	198	197 27	201 02

* Service slack severe. † Service slack moderate. ‡ Speed restricted to 70 m.p.h., York to Darlington. § Bridge rebuilding slack, 3 m.p.h.; loss 3¼ min. ‖ Prolonged signal check, 5 m.p.h.; loss, 3¾ min. ¶ Relaying slack, 20 m.p.h.; loss, 3 min. †† Slack to take water, 68 m.p.h.

went up the final 3 miles at 1 in 178 to Stoke Summit at a minimum of 77½ m.p.h. The complete ascent of 15·3 miles from Tallington to Stoke, including 3 miles at 1 in 178, 4½ miles at 1 in 200, 2¼ miles at 1 in 240-264, and 1¾ miles at 1 in 330-440, and the remaining 3¾ miles level in short strips, begun at 90 m.p.h. and finished at 77½ m.p.h., was thus run at an average for the entire distance of 83·5 m.p.h.—a remarkable achievement.

Speed touched 86½ m.p.h. at Great Ponton, but was reduced to 67 through Grantham. The falling grades through Barkston and Hougham produced a maximum of 93½ m.p.h., with the result that by Newark 3 min. of the 6 min. arrears at Hitchin had been recovered; net time for the 120·1 miles from London to this point was 95⅜ min. A bad permanent way check near the 124 milepost, to 20 m.p.h., preceded the climb to Markham, but there was a vigorous acceleration in 3 miles to 72½ m.p.h. at Crow Park, after which 1¼ miles at 1 in 300 and 2¾ at 1 in 200 were surmounted at a minimum of 70½ m.p.h., and the broken ascent from Dukeries Junction on to Markham Summit was surmounted at a steady 75. Speed reached 86½ m.p.h. before a careful slowing to 60 through Retford. The only relatively easy running of the journey was between here and Doncaster, with no more than 83½ m.p.h. at Scrooby, 74 up the 3 miles mostly at 1 in 198 to Piper's Wood, and 85 at Rossington, followed by a long and careful slowing to 64 m.p.h. through Doncaster. On the dead level from Doncaster to Balne speed increased in the first 2 miles (to Arksey) from 64 to 74 m.p.h.; in 2 miles more (Shaftholme) to 80½; 3 miles further raised the rate to 90 m.p.h. at Moss, and another 3 miles to 92 at Balne. Fluctuations over broken grades at between 83½ and 85 m.p.h. succeeded until steam was shut off for Selby, passed at 30 m.p.h.; more than 1½ min. had been recovered between Doncaster and Selby. From Selby to York the allowance of 12½ min. only for the 13·8 miles, with its slow commencement, the 55 m.p.h. slack at Chaloner Whin Junction, 2 miles short of York, and the dead slow running through York, is a counsel of perfection, and despite speeds of 77½ m.p.h. at Riccall, 80½ at Escrick, and 86½ at Naburn, on grades very slightly adverse, a minute was lost over this section. Given a continuance of the earlier effort north of York, it should have been comparatively easy to recover the remainder of the arrears, but the driver, with the general restriction in mind, did not allow his speed at any point to exceed 75 m.p.h. (save for a momentary 79 at Croft Spa), and the express was thus 3 min. late into Darlington. But, as previously mentioned, out of 10 min. lost by out-of-course slacks, 7 min. had been recovered on this remarkable journey, and that notwithstanding a caution through various stations and junctions, such as Grantham, Retford, and Doncaster, which was even more scrupulous than the regulations require. The first of the two runs described was timed by Mr. H. J. J. Griffith, and the second by Mr. Cecil J. Allen, M.Inst.T., to whom we are indebted for this detailed description.

By the courtesy of Mr. H. N. Gresley, Chief Mechanical Engineer of the London & North Eastern Railway, we are able to reproduce a speed chart taken from the Flaman self-recording indicator on streamlined Pacific No. 2510 *Quicksilver*, when working the up Silver Jubilee on February 14 last. This again emphasises the remarkable rapidity with which the engine accelerates from all reductions of speed, and also, in the automatically signalled area north of York, the striking exactness with which the 70 m.p.h. speed limit can be observed, when the driver is thus provided with means whereby his actual speed is constantly under his observation. From the start at Darlington, a speed of 60 m.p.h. was attained in about 4 min., and speed was then kept entirely between the limits of 67 and 73 m.p.h. on to York. It required 3¾ min. from the 20 m.p.h. slowing through York to re-attain 60 m.p.h., but the engine was obviously worked easily to Chaloner's Whin Junction so that the 50 m.p.h. restriction at this point (2 miles from York) should not be exceeded, and a maximum of 83 m.p.h. was reached near Escrick. From Selby slack (25 m.p.h.) the engine was travelling again at 60 m.p.h. in roughly 2½ min., and at 70 m.p.h. in 4 min., after which there came a bad permanent way relay check, to 20 m.p.h. From this speed recovered to 60 m.p.h. in 2½ min., to 70 m.p.h. in a shade over 4 min., and to 80 m.p.h. in 6½ min. from the check. Speed was eased to 65 m.p.h. through Doncaster, and a second permanent way check, to 15 m.p.h., was then experienced. Doncaster had been passed on time, but notwithstanding an acceleration from 15 to 60 m.p.h. in just over 2½ min., partly up the rising gradient of 1 in 198 to Piper's Wood, and an easing to 70 m.p.h. over Scrooby water-troughs, the Silver Jubilee was 3 min. behind time through Retford. Speed here was eased to 70 m.p.h., and the rising grades onwards to Markham summit (1 in 200 and 1 in 178) were surmounted at a steady 70-68 m.p.h. Across the Trent Valley speed was allowed to rise to 85 m.p.h., but was checked to 70 for Muskham water-troughs. Beyond Newark, despite steadily rising grades, there was an acceleration to 83 m.p.h., dropping gradually as the grades steepened to 1 in 200, until the final length to Stoke summit was surmounted at 64 m.p.h. In 2¼ min. from Stoke there was a rapid acceleration down 1 in 178 from 64 to 88 m.p.h., after which speed ruled steadily round the 90 m.p.h. mark until checked to 68 m.p.h. for



Graph from Flaman speed recorder of L.N.E.R. Pacific locomotive "Quicksilver" on Silver Jubilee express from Darlington to King's Cross

Werrington water-troughs. Passing Peterborough at 28 m.p.h., where all but a minute of the two permanent way checks had been recovered, the driver took about 1½ min. to speed up from 28 to 50 m.p.h., 3 min. to reach 60, and a little under 6 min. to attain 80 m.p.h., but a third severe permanent way slowing brought the speed down to 20 m.p.h., recovery from which had to be up the 1 in 200 of Abbot's Ripton bank, on which 60 m.p.h. was attained 2½ min. after the slack, subsequently increased to a maintained 64 m.p.h. up the grade. Round Offord curves there was a reduction from 82 to 70 m.p.h., and some notable work was then performed along the length from St. Neots to Hitchin, the tendency of which is slightly against the engine for most of the distance, steepening finally to 1 in 200, which continues past Hitchin to Stevenage. Yet the average speed from Huntingdon to Hitchin was 83 m.p.h.; near Tempsford it rose to all but 90 m.p.h., and the minimum at Stevenage was 72 m.p.h.

Another notable feat was the maintenance of a minimum of 83 m.p.h. up the rising grades from the crossing of the Lea near Hatfield to Potter's Bar, partly at 1 in 200. The dead slowing for New Barnet bridge reconstruction—the fourth of the checks suffered by the train—made timekeeping impossible, and the arrival was 4 min. behind time. But at least 10 min. had been lost by out-of-course slowings, and the net time for the 232·3 miles from Darlington—192 min.—showed that the engine had regained 6 min. of the loss.

High Speed in Germany

In the May 29 and June 5 issues of THE RAILWAY GAZETTE details were given of the itinerary of the Institution of Locomotive Engineers party on its recent summer meeting in Germany; the present article sets out some of the notable locomotive performances to which it was entertained. On Saturday, May 30, a special train was run from Berlin to Hamburg and back; it consisted of a dynamometer car and two passenger cars, weighing 137 *tonnes* tare (135 tons), and 141 tons with passengers, and was hauled by engine No. 05.002—the second of the streamlined 3-cylinder 4-6-4's of Borsig design, fully described in our issue of June 21, 1935. These two engines, which have 7 ft. 6½ in. driving wheels, are engaged on the non-stop FD service between Berlin and Hamburg, of which the running time, since their introduction, has been reduced to 144 min. westbound and 145 min. eastbound (74·2 and 73·7 m.p.h. respectively from start to stop) for the 178·1 miles, with a five-coach load averaging in weight 210 tons. A third engine of the same general arrangement, but to be fired with pulverised fuel, is now under construction, and this will have the driver's cab at the front end.

Owing to the fact that the journeys about to be described were made on the Saturday before Whitsun, there was some difficulty in obtaining a path for unobstructed fast running, and several signal checks were encountered; but between the stops specially arranged so that the occupants of the footplate might be changed, and the maximum possible number of the party witness the methods of working the engine, some extremely fast running was made, culminating in the attainment of a maximum speed of 115 m.p.h. From each start, full cut-off was used, but the train was barely in motion before this was brought back to 20 per cent., at which figure the engine was worked throughout. The regulator was kept mostly about two-thirds open, with the result that the pressure in the steamchest remained generally at 10 to 12 atmospheres (142 to 170 lb. per sq. in.), although at 12 atm. in the steamchest the engine ran freely at 100 m.p.h. To produce the acceleration to 115 m.p.h. the regulator was opened a little further, raising the steamchest pressure to 16 atm. (227 lb.), and a similar opening was used for each start. It is clear from such details as these that the engine has ample power in reserve; actually the maximum speed reached on test has been 202 km.p.h., which is equivalent to 125½ m.p.h.

The running times on May 30 appear in the table annexed. The train left Berlin (Lehrter Bahnhof) at 8.3 a.m., and signal checks were experienced in the early stages, culminating in a stop at Nauen. Thence from the dead start, Bad Wilsnack, 48·13 miles, was passed in 33 min. 7 sec., speed having twice risen to 100 m.p.h., and the engine was then eased, and finally stopped by adverse signals between Kuhblank and Wittenberge. A stop was made in Wittenberge station, and it was between there and Ludwigslust, where the train also stopped, that the 115 m.p.h. maximum was reached, with the assistance of a faint down gradient, at no point steeper than 1 in 500. A distance of 25·0 miles from the Wittenberge start was run in 18 min. 9 sec., and with a slow stop Ludwigslust, 27·39 miles, was reached in 20 min. 58 sec. The 19·39 miles from Dergenthin to km. 167 were covered in 11 min. 30 sec., at a pass-to-pass average of 101·0 m.p.h. From the Wittenberge start the train reached 100 km.p.h. in 3 km. (62 m.p.h. in under 2 miles), 128 km.p.h. in 7·3 km. (all but 80 m.p.h. in 4½ miles), 140 km.p.h. in 11 km. (87 m.p.h. in under 7 miles), and 150 km.p.h. in 13·5 km. (93 m.p.h. in under 8½ miles), the acceleration being thus very rapid but perfectly even throughout. From Ludwigslust, to avoid getting too far ahead of time, the engine was worked a little more easily, though speed rose momentarily to 101 m.p.h. between Brahlstorf and Kuhlenfeld; slight slacks were made through Hagenow Land, Putzier, and Boizenburg, and a very severe check before Friedrichsruh, where an underline bridge was in course of reconstruction. Schwarzenbek, 48·75 miles, was passed in 35 min. 48 sec., but owing to signal delays the total time from Ludwigslust to Hamburg, 71·97 miles, was 63 min. 6 sec.

On the return journey, begun at 1.30

GERMAN STATE RAILWAY—BERLIN-HAMBURG

Institution of Locomotive Engineers' Special Train, May 30, 1936
Engine: Streamlined 3-cyl. 4-6-4 No. 05.002. Load: 135 tons tare; 141 tons gross.

Miles		Time min.	Time sec.	Speeds Max. & Min. m.p.h.	Av.† m.p.h.
0·00	NAUEN (sig. stop)	0	00	—	—
4·22	Berger Damm	5	38	—	49·3
8·45	Paulinenaue	8	26	99	90·6
13·54	Vietznitz	11	30	101	99·6
16·33	Friesack	13	15	97½	97·7
24·90	NEUSTADT	18	29	97	97·1
29·93	Zernitz	21	35	100½/93	97·4
35·27	Breddin	24	55	98	96·5
41·30	Glöwen	28	40	88*	96·5
48·13	Bad Wilsnack	33	07	—	92·1
52·60	Kuhblank	36	25	—	81·3
		sig. stop			
56·70 / 0·00	WITTENBERGE	48	02	—	—
		0	00	—	—
5·65	Dergenthin	6	39	82	51·0
10·99	Karstadt	10	18	97½	87·7
17·51	Wendisch	14	07	106½	102·5
22·73	Grabow	16	57	—	110·5
25·00	Km. 167	18	09	115	113·5
27·39 / 0·00	LUDWIGSLUST	20	58	—	50·9
		0	00	—	—
6·15	Jasnitz	7	17	78	50·7
8·69	Strohkirchen	9	09	83	81·7
13·10	HAGENOW LAND	12	27	71*	80·2
19·81	Putzier	17	10	97½ 82*	85·4
25·34	Brahlstorf	20	51	95	90·1
29·50	Kuhlenfeld	23	22	101	99·2
33·66	Boizenburg	26	03	85*	93·0
38·38	Schwanheide	29	18	93	87·2
42·35	BÜCHEN	31	46	98	96·6
48·75	Schwarzenbek	35	48	93½	95·2
		p.w.	slack	25	
55·14	Friedrichsruh	42	07	—	60·7
65·08	Mittlerer Land	50	40	—	69·8
		sig. stop			
71·97	HAMBURG	63	06	—	—

* Speed reduced for curves

GERMAN STATE RAILWAY—HAMBURG-BERLIN

Miles		Time min.	Time sec.	Speeds Max. & Min. m.p.h.	Av.† m.p.h.
0·00	HAMBURG	0	00	‡	—
16·83	Friedrichsruh	26	12	64	—
		p.w.	slack	15	
23·22	Schwarzenbek	33	44	2	—
29·62	BÜCHEN	38	01	92	89·7
33·59	Schwanheide	40	29	100	96·6
38·31	Boizenburg	43	28	86*	94·9
42·47	Kuhlenfeld	46	22	—	86·1
46·63	Brahlstorf	49	01	98	93·0
				60*	—
52·16	Putzier	53	07	80½	80·6
58·87	HAGENOW LAND	58	45	72*	71·5
63·28	Strohkirchen	62	05	90½	79·4
65·82	Jasnitz	63	43	96½	93·3
71·97	LUDWIGSLUST	68	04	70*	84·8
76·63	Grabow	71	07	95½	91·7
81·85	Wendisch	74	20	100	97·4
88·37	Karstadt	78	25	96	98·3
91·16	Km. 140	80	07	—	98·5
92·03 / 0·00	Km. 138·6	81	07	—	52·2
		0	00	—	—
1·68	Dergenthin	3	11	—	—
7·33 / 0·00	WITTENBERGE	8	41	—	—
		0	00	—	—
4·10	Kuhblank	4	55	—	50·0
8·57	Bad Wilsnack	7	52	96	90·9
15·40	Glöwen	12	15	80*	94·2
21·43	Breddin	16	13	101	91·2
26·77	Zernitz	19	28	98½	98·6
31·80	NEUSTADT	22	32	100	98·4
40·31	Friesack	27	40	101	99·5
43·16	Vietnitz	29	22	103½	100·6
48·25	Paulinenaue	32	21	101	102·4
56·70	NAUEN	37	53	eased	91·6
62·04	Brieselang	41	31	—	88·2
65·95	Falkensee	44	06	—	90·8
70·11	Km. 13·9 (sig. stop)	48	32	—	—

† Average from station to station ‡ Sig. checks.

p.m., there were again severe signal delays, together with the Friedrichsruh bridge slowing, with the result that the first 23·33 miles to Schwarzenbek occupied 33 min. 44 sec. Slacks at Putzier, Hagenow Land, and Ludwigslust, though slight, also affected the average speed, though a maximum rate of 100 m.p.h. was twice attained along this length, beyond Büchen and shortly after Ludwigslust. On passing Km. 140, an emergency stop was made, and in the space of no more than 1·4 km. (0·87 mile) the speed was brought down from all but 100 m.p.h. to zero in exactly one minute, with unexceptionable smoothness — a remarkable test of the efficiency of the braking equipment. From this stop the 7·33 miles to Wittenberge were run start-to-stop in the smart time of 8 min. 41 sec.

The fastest start of the whole series was then made from Wittenberge. The first 1·8 km. (to Km. 125) was run in 2 min. 18 sec., after which successive kilometres took 37, 34·6, 31.6, 28, 27, and 26·6 sec.; that is to say, 60 m.p.h. was attained in less than 1½ miles after starting, 71 m.p.h. in 3 miles, 80 m.p.h. in 4 miles, and Bad Wilsnack, 8·57 miles from the start, was passed in 7 min. 52 sec., at 96 m.p.h. The 26·82 miles from Breddin to Paulinenaue were run at an average speed of 99·7 m.p.h. and a maximum of 103½ m.p.h. was reached at Friesack. So Falkensee, 65·95 miles from Wittenberge, was passed in 44 min. 6 sec., but before reaching Spandau West the train was pulled up by adverse signals, having covered a distance of 70·11 miles in 48 min. 32 sec., at an average of 86.7 m.p.h. from start to stop. It only remains to add that the travelling throughout was perfectly smooth—and even on the footplate the riding was but little inferior in smoothness to that of the coaches—and with the acoustic effect of rails 30 m. long (98 ft. 5 in.) it was difficult to realise, apart from reference to kilometre posts and the dynamometer car speed indicators, that such enormous speeds were being run. Incidentally, the speed indicator in the dynamometer car (which is provided for visual information only, and is not concerned with the actual work of recording) was registering slightly on the high side, but in the tabulated figures direct chronograph readings off the kilometre posts have been substituted, and will be found in general agreement with the station to station averages. No fewer than 250 miles were covered at an average speed of 91 m.p.h. on this one round journey.

Another journey of considerable interest, in which the institution party participated, was that made on train No. D.39 from Munich to Nuremberg, the weight of which was increased, by the two coaches provided for the party, to a total of 14 vehicles, of 665·6 *tonnes* tare (655 tons) and a little short of 700 tons gross. This was hauled by electric locomotive No. E.1805, of the 1-Do-1 type. As the second table reveals, this machine proved capable of moving its load over level track at sustained speeds well in excess of 70 m.p.h. The 27·7 miles between Lochhausen and Hochzoll were covered in 23 min. 17 sec., with a maximum of 76½ m.p.h., and the run of 38·4 miles

GERMAN STATE RAILWAY—MUNICH–NUREMBERG
Electric locomotive No. E.1805. Type 1-D$_o$-1.
Load : 14 cars. 655 tons tare ; 695 tons gross.

Miles		Time min.	sec.	Speeds Max. & Min. m.p.h.	Av.† m.p.h.
0·0	MUNICH ..	0	00	—	—
		p.w.	slack		
4·6	Pasing ..	8	14	—	—
7·8	Lochhausen ..	11	31	—	58·5
11·9	Olching ..	14	48	76½	74·9
15·4	Maisach ..	17	43	—	72·0
19·3	Nannhofen ..	20	53	—	73·9
22·8	Haspelmoor ..	23	56	67	69·8
28·6	Mering ..	28	50	—	71·0
32·3	Kissing ..	31	54	—	72·4
35·5	Hochzoll ..	34	48	50*	66·2
38·4	AUGSBURG	38	54	—	—
0·0	AUGSBURG	0	00	—	—
7·0	Gablingen ..	8	02	72½	52·3
12·7	Meitingen ..	12	48	71½	71·2
16·1	Nordendorf ..	16	18	40*	58·3
20·8	Mertingen ..	21	23	74	55·5
25·3	DONAUWORTH ..	25	27	60*	66·4
32·4	Mündling ..	31	36	72½	69·5
35·5	Fünfstetten ..	34	18	67	68·9
39·2	Otting ..	37	28	71½	70·1
41·5	Gundelsheim ..	39	20	76½	74·8
43·3	Mohren ..	41	02	55*	63·5
		p.w.	slack	15	
46·8	TREUCHTLINGEN	45	22	—	48·5
52·4	Weissenburg ..	51	06	—	58·6
58·2	Pleinfeld ..	56	39	—	62·7
64·2	Georgensmünd ..	61	32	76½	73·7
		p.w.	slack	20	
69·4	Roth	67	55	—	48·9
71·4	Buchenbach ..	69	45	62½	65·5
76·0	Schwabach ..	73	43	—	69·6
80·1	Reichelsdorf ..	77	06	76½	72·7
82·1	Eibach	78	45	—	72·7
85·3	NUREMBERG ..	82	41	—	48·9

* Speed reduced for curves
† Average from station to station

from Munich to Augsburg was made in 38 min. 54 sec., or about 37 min. net, from start to stop. With such a load as this, the start from Augsburg to Gablingen—7·0 miles start to pass in 8 min. 2 sec.—was notable, and despite two severe permanent way slacks, and three slight service slacks, the 85·3 miles from Augsburg to Nuremberg were run in 82 min. 41 sec., or about 78½ min. net, from start to stop. Speed was not allowed to exceed a maximum of 76½ m.p.h., which was reached at three different points.

By comparison with these performances of steam and electricity, a run on the diesel-electric Fliegende Münchener from Nuremberg to Berlin is of interest. This train consists, from Nuremberg, of two two-car units, one from Munich and the other from Stuttgart, coupled together and worked as a multiple-unit train. Each unit weighs 92 *tonnes* (90½ tons), and accommodates 74 passengers in very comfortable conditions, so that the maximum passenger complement of the four cars is 148; each unit also now has a small kitchen from which hot as well as cold meals are served to passengers where they sit. From Nuremberg to Leipzig the route is in part through the mountainous districts of the Thuringian Forest, culminating in the summit at Steinbach, between Rothenkirchen and Probstzella, which is approached by a grade of 1 in 40. Further, the curvature throughout over the 85 miles between Lichtenfels and Jena is such as to preclude any high speed being booked over this length. Despite a severe slack for tunnel repairs at Erlangen, the 58·6 miles from Nuremberg to Lichtenfels were run in 50 min. 43 sec., speed over this length being not allowed to exceed between 85 and 88 m.p.h. Beyond Kronach, a speed of between 50 and 55 m.p.h. was maintained up 1 in 120 grades, but at the foot of the final ascent to the summit, an electric fuse was blown, and the train had to stop in order that it might be replaced. The stop lasted 8 min. 43 sec., and probably cost about 10½ min.; after restarting a speed of 47 m.p.h. was attained on steeply rising gradients, and fell back to 32 m.p.h. on the final 1 in 40. Beyond the summit further permanent way slacks were experienced, so that on passing Probstzella, a total of 16½ min. in all had been lost. Between Saalfeld and Jena, where the lost time was being recovered, a length of 30·6 miles was covered in 26 mins. 9 sec., despite much curvature. The final 56·1 miles from Jena to Leipzig occupied 50 min. 14 sec., notwithstanding several slight service slacks and one signal check, and the arrival was 3½ min. early. So the distance of exactly 200 miles from Nuremberg to Leipzig had been covered in 204 min. 36 sec., but the net time was not more than 187 min., or 21 min. inside schedule.

From Leipzig to Berlin (Anhalt) the Fliegende Münchener is allowed 78 min. for the 102·2 miles, demanding an average speed of 78·6 m.p.h.; this includes a 50 m.p.h. slowing through Bitterfeld, and a severe slack across the bridge over the Elbe near Wittenberge. The running was as shown in the annexed table; a maximum speed of 100 m.p.h. was twice attained, and 82 miles of the journey were covered at an average rate of just under 92

GERMAN STATE RAILWAY—LEIPZIG–BERLIN
Two twin diesel units coupled : 181 tons tare ; 188 tons gross.

Miles		Time min.	sec.	Speeds Max. & Min. m.p.h.	Av.† m.p.h.
0·0	LEIPZIG ..	0	00	—	—
4·2	Neuwied ..	5	55	—	42·6
7·0	Rachwitz ..	7	55	90	84·0
10·0	Zachortau ..	9	48	98½	93·9
13·0	Delitzsch ..	11	57	75*	83·7
16·8	Grube Ludwig ..	14	28	92½	90·6
20·3	BITTERFELD ..	17	27	50*	70·4
23·5	Muldenstein ..	20	30	—	63·0
26·6	Burgkemnitz ..	22	49	92½	80·3
32·7	Radis	26	40	—	95·1
37·3	Bergwitz ..	29	29	100	98·0
41·0	Pratau	31	59	—	88·8
		p.w.	slack	30	—
43·2	WITTENBERGE ..	35	12	—	41·0
50·0	Zahna	40	38	90	75·1
55·4	Blonsdorf ..	44	05	—	93·9
63·0	JUTERBOG ..	48	45	100	97·7
71·1	Luckenwalde ..	53	45	—	97·2
80·7	Trebbin	59	43	—	96·5
86·8	Ludwigsfelde ..	63	30	98	96·7
90·7	Grossbeeren ..	66	08	—	88·8
		ceased			
96·4	Lichterfelde Ost ..	70	27	—	79·2
102·2	BERLIN (ANHALT)	77	11	—	—

* Speed reduced for curves
† Average from station to station

m.p.h. Berlin was thus reached in 77 min. 11 sec., ¾-min. early. The travelling of the railcar units was of perfect smoothness. The times and speeds in this article were recorded by Mr. Cecil J. Allen, M.Inst.T., to whom we are indebted for this description of the running.

Institution of Mechanical Engineers Summer Meeting

Members of the Institution of Mechanical Engineers assembled in York last Monday for the annual summer meeting, and in the afternoon a party of them visited the ruins of St. Mary's Abbey, the Hospitium, and the Museum of Roman Antiquities, being conducted by Dr. Walter E. Collinge, M.Sc., F.S.A., the keeper. An informal meeting was held in the evening in the dining room of the Royal Station Hotel, which had been converted into a lounge for the occasion.

On Tuesday the President, Mr. H. N. Gresley, C.B.E., D.Sc., the members, and ladies, were received in the Tempest Anderson Hall of the Yorkshire Museum, kindly lent by the Yorkshire Philosophical Society, by the Lord Mayor of York (Councillor W. H. Shaw, J.P.) and the York Reception Committee. In replying to the Lord Mayor's speech of welcome, Mr. Gresley announced the bestowal upon the institution of the Patronage of H.M. the King, and read a letter which he proposed submitting to Lord Wigram in expression of the deep gratitude of the members at York and the institution as a whole. He referred to the important part played by York in the early development of railways, which, coupled with attractions of the city, made it a most appropriate venue for the summer meeting.

Mr. F. E. Smith, M.A., Chief Engineer of I.C.I. (Fertilisers and Synthetic Products Limited) of Billingham, then read a most instructive paper, illustrated with lantern slides, on "Plant for the Production of Petrol by the Hydrogenation of Bituminous Coal." The plant at Billingham was visited by members yesterday (Thursday). Mr. Gresley thanked Mr. Smith on behalf of himself and the members, and moved votes of thanks to all who had contributed to the success of the visit.

After luncheon in the De Grey Rooms, members formed parties to visit various works and places of interest in and near York. The President personally conducted a party round the L.N.E.R. York carriage building and repair works, where all processes involved were studied. Tea was served by the company in one of the latest dining cars, standing in the yard, and a new electric buffet car and other vehicles completed in the works only that morning were inspected. A vote of thanks to the President and to the L.N.E.R. proposed by a member was replied to by Mr. Gresley. Among the other visits in the afternoon was one to the L.N.E.R. colour-light signalling installation.

In the evening, by invitation of the Lord Mayor, the Lady Mayoress, and the Corporation of York, a reception and dance was held in the Exhibition Buildings.

On Wednesday there were alternative visits to works and places of interest in York, Doncaster, and Sheffield. The objective of the Doncaster party was the L.N.E.R. locomotive works, reached by special train from York. On arrival Mr. Gresley conducted the party round several sections of the works, including machine and erecting shops, where many recently installed machine tools were seen operating on locomotive parts. The 2-8-2 express locomotive No. 2001, *Cock o' the North*, was seen under repair.

Much interest was taken in a line of engines outside in the yards, which included the new fully streamlined "Cock o' the North" class locomotive *Lord President*, and one of the new 2-6-2 express engines, *Green Arrow*, with streamlined dome cover and cab front, wide firebox, and 6-ft. dia. coupled wheels. Others in the line were the streamlined Pacific, *Silver Link*, Pacific No. 4472, *Flying Scotsman*, Atlantic No. 4420, and a 2-6-2 tank engine for Scotland.

Mr. William Whitelaw, Chairman of the L.N.E.R., presided at a luncheon to which the party was entertained by the company. A vote of thanks to Mr. Whitelaw and Mr. Gresley was proposed by a member, Mr. Taylor, of Birmingham, and suitable replies were made by both.

In the afternoon, one party of members visited the L.N.E.R. Doncaster carriage works. Another, including the President, made a tour of the Dukeries, while a third party visited the glass works of Pilkington Brothers, and the Rockware Glass Syndicate. The return from Doncaster was made by special train at 4.40 p.m., and tea was provided *en route* by the L.N.E.R.

The institution dinner was held at the Exhibition Buildings, York, on Wednesday evening, when guests were received by the President, Mr. Gresley, and Miss Violet Gresley. The dinner was followed by dancing from 10.30 p.m. to midnight.

Lt.-Col. E. Kitson Clark (Past President) proposed the toast of "The City of York," for which he said he had a great admiration as the centre from which all Northern civilisation, comfort and culture emanated. The Lord Mayor replied.

Mr. William Whitelaw proposed the health of the institution, and said a more romantic place for its meeting could not have been found than one within 50 miles of Stockton and 100 miles of Killingworth, on account of their association with George Stephenson and Edward Pease.

Mr. Gresley, replying, said there was no reason why the locomotive of today should not be greatly improved in the near future. The membership of the institution now approached 12,000.

On Thursday members visited either the I.C.I. works at Billingham, works at Leeds and Huddersfield, or went to Hull, where there was a choice of a whole-day trip on the Humber by invitation of the L.N.E.R., including inspection of the company's new fish dock at Grimsby, or morning and afternoon visits to various works or to the L.N.E.R. Alexandra and King George V docks. In the evening a reception and dance was held at the Assembly Rooms by invitation of the Yorkshire Branch Committee of the institution. The meeting concludes today (Friday) with excursions either to Rievaulx Abbey, Ripon Cathedral, and Fountains Abbey, or to Scarborough and Whitby.

The International Welding Congress

The Twelfth International Congress of Acetylene, Oxy-acetylene Welding, and Allied Industries, organised by the British Acetylene Association, was inaugurated in London at the Guildhall on Monday last, June 8, and concludes tomorrow (Saturday) with a meeting of the permanent committee at the Caxton Hall, S.W.1, where papers on welding subjects have been read and discussed throughout the week. The papers dealing with railway applications are summarised on page 1116. Programmes of cinema films have also been shown daily during the congress, the subjects including rail welding and resurfacing of points and crossings, rail bonding, and autogenous welding in railway workshops and for permanent way. An exhibition of welding practice has been arranged at the Caxton Hall, and has been contributed to by Austria, France, Germany, Holland, Hungary, Poland, and Russia.

On the opening day, a Government reception was held at Lancaster House, S.W.1, when the guests were received by the Rt. Hon. Sir Kingsley Wood, Minister of Health, and Lady Wood. The Congress Banquet took place at the Gosvenor House Hotel, Park Lane, on Tuesday. The visits and excursions organised for the delegates began on Wednesday, when a choice was offered of inspecting the works of the British Oxygen Co. Ltd. at Cricklewood and Edmonton, or of Electrolux Limited at Luton. Thursday evening was occupied by a trip on the Thames, the party travelling by special trains from Paddington to Marlow and Windsor to Paddington. Tonight (Friday) delegates visit the Aldershot Tattoo as guests of the British Oxygen Co. Ltd.

Forthcoming Events

June 19–20.—Institution of Railway Signal Engineers, at Liverpool. Summer Meeting.
June 19–21.—Stephenson Locomotive Society. Summer Tour.
June 26 (*Fri.*)—East Indian Railway Officers, at Trocadero Restaurant, Piccadilly Circus, London, W.1, 6.30 for 7 p.m. Annual Dinner.

RAILWAY AND OTHER MEETINGS

Antofagasta (Chili) and Bolivia Railway Co. Ltd.

The annual general meeting of the Antofagasta (Chili) and Bolivia Railway was held at Winchester House, Old Broad Street, E.C.4 on June 9, Mr. A. W. Bolden (Chairman and Managing Director) presiding.

The Secretary, Mr. C. Cowley, read the notice convening the meeting and the auditors' report.

The Chairman, in moving the adoption of the report and accounts, referred to the loss sustained by the company in the death of Mr. R. J. Hose, who had been for many years a valued member of the board. Mr. Harold C. Drayton had been invited to fill his place.

Results for the year showed some improvement. In broad terms, passenger traffic in Chile was practically the same as in 1934, but goods had increased by 18 per cent. In Bolivia, there had been better passenger traffic, while goods improved by 26 per cent. These improvements were not fully represented by the figures for the year, these being based upon the official rates of exchange. Had the rates been the same for both years, sterling revenue would have gone up, but in 1935 the Chilean peso was at half its 1934 value.

During the year under review, the tonnage of copper bars improved by 14,000; of tin by 3,000; of mining articles by 34,000; and of general merchandise by 5,000. Nitrate production was at a low ebb, and this traffic showed an increase of only 2½ per cent. Passenger traffic in Chile decreased 5 per cent., but in Bolivia went up 40 per cent.

Chilean coal had been used quite extensively as fuel for locomotives, in which service 10 tons performed the work of 5½ to 6 tons of oil. Some economy, however, was made possible by the fact that coal wagons, unlike tank wagons, could often return with paying loads instead of being sent back empty. The operating ratio of the railway in 1935 was 56·5 per cent., compared with 60 per cent. in 1934. Expenses in Chile had been increased by the payment of higher wages.

A dividend of 2½ per cent. was recommended on the cumulative preference stock, being the balance payable in respect of 1932. Sir Bernard Greenwell moved the election of Mr. H. C. Drayton as a director of the company, and the resolution, seconded by Mr. A. G. Hunt, was carried unanimously. After the report and accounts had been unanimously adopted, the meeting closed with a vote of thanks to the Chairman, the board, and the staff of the company in South America.

CONTRACTS AND TENDERS

L.M.S.R. Rolling Stock Orders

The Fairfield Shipbuilding and Engineering Co. Ltd. has received an order from the L.M.S.R. for eight 50-ton bogie bolster trucks.

We understand that orders for 1,000 20-ton hopper wagons have been placed by the L.M.S.R. with the following firms: Gloucester Railway Carriage & Wagon Co. Ltd., 300 in wrought iron; Fairfield Shipbuilding & Engineering Co. Ltd., 200 in wrought iron; Metropolitan-Cammell Carriage & Wagon Co. Ltd., 250 in copper bearing steel; Birmingham Railway Carriage & Wagon Co. Ltd., 150 wagons; and G. R. Turner Limited, 100 wagons.

D. Wickham & Co. Ltd. has received an order from the Anglo-Siam Corporation for one four-seater petrol-driven inspection railcar.

Sydney Smith & Sons (Nottingham) Ltd. has received orders from the Chinese Government Purchasing Commission, to the inspection of Messrs. Fox & Mayo and for use on the Canton-Hankow Railway, for a deadweight checking apparatus and for duplex steam gauges.

The L.N.E.R. has placed the following orders for the replacement of hydraulic appliances at the hydraulic power station, Sheffield, with electrically operated appliances:—

Cowans Sheldon Co. Ltd.: one 50-ton electric Goliath crane.

J. M. Henderson & Co. Ltd.: one 10-ton fixed jib electric crane.

Vaughan Crane Co. Ltd.: one 25-cwt. fixed jib electric crane, 12-ft. 6-in. radius; one fixed jib electric crane, 9-ft. radius.

The Yorkshire (Woollen District) Transport Co. Ltd. has placed a contract with the Clayton Dewandre Co. Ltd., Lincoln, for "B" type Verometer ticket issuing machines, together with a full complement of Clayton patented ticket cancelling units. This equipment will be used for the complete Dewsbury Town services.

The Patent Shaft and Axletree Co. Ltd. has received an order from the Assam Bengal Railway, through Messrs. Rendel, Palmer, & Tritton, for two 65-ft. turntables.

The Associated Equipment Co. Ltd. has received orders from Pickfords Limited for eight oil-engined Matadors and two oil-engined Mammoth Major Sixes. Orders have also been received from the Ottawa Electric Railway Company for two oil-engined Regals, and from the Sydney Transport Board for two type 664T.

Boilers Required for India

Tenders are invited, receivable by the Bengal-Nagpur Railway at 132, Gresham House, Old Broad Street, London, E.C.2, by June 23, for five boilers for F.T.S. class tank locomotives.

It is reported that the Commissioner for Railways, Sydney, New South Wales, is enquiring for tenders for steam pressure reducing and de-superheater equipment and a 25,000-kVA frequency changer for White Bay electric power station.

The Director of Public Works, Casablanca, is calling for tenders for supply of a 120-ton crane required for laying blocks of stone for quay walls. Applications to tender must reach Casablanca before July 17. Further particulars may be had from the Department of Overseas Trade, quoting reference T.Y. 30,319.

The interests of Associated Locomotive Equipment Limited have been identified with those of Caprotti Valve Gears Limited, and Mr. F. J. Kuretschka is now Managing Director of both companies. The offices of Associated Locomotive Equipment Limited are being transferred to 66, Victoria Street, London, S.W.1, the present offices of Caprotti Valve Gears Limited.

Railway Staff and Labour Matters

There have been further developments of the railway wage question during the past week. Following a joint meeting of the Executive Committees of the National Union of Railwaymen, the Associated Society of Locomotive Engineers and Firemen and the Railway Clerks' Association, on Wednesday, June 3, approaches were made to the General Managers of the four main line railway companies and, as a result, arrangements have been made for a meeting between the parties to be held today.

Sir Herbert Walker, K.C.B., General Manager of the Southern Railway and Chairman of the General Managers' Conference, will preside and it is expected that, in addition to the representatives of the trade unions who have taken part in the previous negotiations with the general managers, the representatives of the National Union of Railwaymen will, on this occasion, be accompanied by the two delegates who were appointed by the union's special general meeting last month.

It is understood that a meeting of the National Railway Shopmen's Council will also be held today, when the arrangement which was proposed in settlement of the claim of the trade unions representing railway shopmen, and which is on parallel lines to the proposal covering the main body of railway staff, will be further discussed.

NOTES AND NEWS

L.M.S.R. "Save to Travel" Scheme Extended.—The L.M.S.R. reports that over 120,000 shilling stamps have been sold to participants in the "Save to Travel" scheme, and that promoters of guaranteed excursions and auxiliary ticket agents may now avail themselves of it.

Gatwick Airport Opened.—On June 6 the new airport at Gatwick was opened by Viscount Swinton, H.M. Secretary of State for Air. Combined rail and admission tickets were issued by the Southern Railway from Victoria, London Bridge, and the suburbs to Gatwick Airport station, which is connected with the airport buildings by a subway.

Fire at Southampton Docks.—A fire which broke out on June 5 at Southampton Docks destroyed the Southern Railway shed used for banana traffic, and between 60 and 70 refrigerator vans which were in the shed, for a consignment from an incoming vessel. The fire was confined to the shed, and about 500 other wagons available for banana traffic were not affected.

Standard and Exceptional Charges Review.—The Minister of Transport having appointed Mr. John Pike to act as a member of the Railway Rates Tribunal during the absence of Mr. John Quirey, the 1936 review of the standard charges and exceptional charges of the four amalgamated railway companies, originally fixed for Wednesday, May 20, and postponed because of the illness of Mr. Quirey, will begin at 10.30 a.m. on Wednesday, June 17, in Court A, Judges' Quadrangle, Royal Courts of Justice, London.

Road Accidents.—The Ministry of Transport return for the week ended June 6 of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding period of last year :—

	Killed, including deaths resulting from previous accidents		Injured	
England ...	109	(100)	4,503	(3,868)
Wales	8	(4)	233	(145)
Scotland ...	15	(10)	518	(351)
	132	(114)	(5,254)	(4,364)

The total fatalities for the previous week were 122, as compared with 97 for the corresponding period of last year.

Improved Service from Glasgow to Inverness.—In addition to the Scottish July train service improvements, detailed in our June 5 issue, a new express is to run daily at 4.30 p.m. from Glasgow (Buchanan Street) to Inverness, covering the 181¼ miles in 5 hr. 10 min., at an average speed of 35·1 m.p.h., and making it possible for the first time to travel from Inverness to Glasgow and back, and have 2½ hr. in the latter city, without night travel. By connection from Edinburgh it will also be possible to make the journey from London to Inverness without night travel, leaving King's Cross at 7.25 a.m., and reaching Inverness at 9.40 p.m. in addition to the present day service which necessitates leaving King's Cross at 4.45 a.m.

Italian Railway Accident.—A passenger train was derailed near Bufola, on the line between Naples and Nola, last Wednesday, causing the death of about 15 persons and injury to a large number of others.

Collision near Cardiff, G.W.R.—The 1.15 p.m. train from Carmarthen to Pontypool Road collided on Wednesday with a stationary light engine at Peterston, about six miles from Cardiff. The whole train was derailed and several persons were injured.

Institution of Civil Engineers Conversazione.—The annual conversazione of the Institution of Civil Engineers was held on Wednesday evening, when, in addition to concerts and other entertainment, lectures were given on "Travel in the Stratosphere," by Prof. G. T. R. Hill, "Lake Tsana and its Interest to Great Britain, Egypt, and the Sudan," by Sir Murdoch MacDonald, M.P., and "Mount Everest," by Dr. Raymond Greene, medical officer to the 1933 expedition. A number of engineering models and scientific appliances were on view, including models of the dock and lift-bridge of the Dover train ferry from Mr. George Ellson, Chief Engineer of the Southern Railway.

Employees Opposed to Argentine Railway Co-ordination.—The annual Congress of La Fraternidad, the Railway Drivers' and Firemen's Union, the oldest railwaymen's union in Argentina, has decided to withdraw the support it had previously given to the railway co-ordination plan approved by the Chamber of Deputies, states a Reuters message from Buenos Aires dated June 9. Their decision was based on the alleged failure of the Chamber to take into consideration questions of work and wages. A 24-hour strike of omnibus workers was declared today, following the announcement that a committee of the Senate had begun the examination of the Railway Co-ordination Bill.

Northern Ireland Traffics.—On railways wholly in Northern Ireland, the number of passengers (exclusive of season-ticket holders) carried during January and February, 1936, was 547,908, against 517,374 in January and February, 1935, and receipts from passengers were £29,613, compared with £26,844. Merchandise and minerals carried in January and February, 1936, were 107,491 tons, against 90,637 in January and February, 1935, and the total receipts from goods traffic were £38,350, compared with £29,263. On railways partly in Northern Ireland, passengers in January and February, 1936, numbered 681,871, against 600,367 in January and February, 1935, and passenger receipts were £52,644, compared with £48,743. Goods and minerals carried in January and February, 1936, were 157,530 tons, compared with 156,167 in January and February, 1935, and total receipts from goods traffic amounted to £103,984, against £94,830.

Austrian Express Derailed.—A Paris-Vienna express was derailed at Ebelsberg, near Linz, Upper Austria, on June 5, the accident resulting in the death of a postal official and one passenger. Six others are reported to have been seriously injured.

Air, Rail, and River Journeys in Germany.—Combined air-rail-river journeys may be made by travellers between Cologne and Frankfort-on-Main on special tickets now being issued by the German Luft Hansa Company.

Buenos Aires Central Railway.—The second supplemental scheme of arrangement proposed by the directors of the Buenos Aires Central Railway, and dated May 7, 1936, was unanimously approved at the adjourned meeting of the holders of the 4½ per cent. first mortgage debentures held on June 4.

Ministry of Transport Inquiry into Willesden Mishap, L.M.S.R.—Major G. R. S. Wilson on June 9 opened the Ministry of Transport inquiry into the mishap of May 29 at Willesden Junction, L.M.S.R., wherein, as recorded last week, a part of a horsebox in a down milk train struck a first class compartment in a train from Bletchley to Euston, inflicting fatal injuries on one passenger.

St. John's Wood Road Station, L.P.T.B., to be Named "Lords."—The London Passenger Transport Board has agreed to the proposal of the Marylebone Cricket Club, recorded in our issue of May 22, that St. John's Wood Road station should be renamed "Lords." The change is not to take place until the new station to be known as "Acacia Road—St. John's Wood," on the Bakerloo-Metropolitan Line connection, is opened.

British Standards Institution Meeting and Luncheon.—At the annual meeting of the British Standards Institution, held at the Institution of Mechanical Engineers on June 4, a warm tribute was paid to the pioneer work in standardisation carried out by the late Sir Archibald Denny. The retiring chairman, Mr. Reavell, referred in his review of the year's work to a forthcoming visit by the Director of the Institution to Argentina, in connection with the newly formed Argentine Institute for the Rationalisation of Materials. At the subsequent luncheon at the Royal Automobile Club, the Rt. Hon. Lord Riverdale, K.B.E., refuted the charge that standardisation meant stagnation, a state of affairs amply guarded against by the frequent reviews and revisions undertaken by the British Standards Institution. He

thought industry did not yet fully appreciate the value of standardisation in allowing stocks to be reduced and capital to be liberated. The Chairman of the Institution for the forthcoming year is Mr. E. J. Elford.

New L.P.T.B. Road Service Guide.—Timetables of L.P.T.B. Central Area buses, trams, and trolleybuses are shown in a new publication of Index Publishers (Dunstable) Limited known as the Red Road Guide. The guide is published on behalf of the board and sells at twopence, being similar in size and format to the revised L.P.T.B. railway timetables reviewed in our issue of May 8. The first issue is current from June 1 to August 4.

The Swansea & Mumbles Railway.—The report of the South Wales Transport Co. Ltd. shows that the returns from the Mumbles Railway & Pier Enterprise were £2,000 higher during 1935 than in the preceding year. This railway, which extends from Swansea to Mumbles, was originally incorporated as the Oystermouth Railway or Tramroad Company on June 29, 1804, and is believed to have been the first railway to carry fare-paying passengers. It was opened from Swansea to Oystermouth in 1807 and has been worked successively by horse, steam (since 1877), and electricity (since 1929). The undertaking is leased by the South Wales Transport Co. Ltd.

Agreed Charges.—Thirty-two more applications for the approval of agreed charges have been lodged with the Railway Rates Tribunal, as will be seen from the legal notice published on page 1138. A copy of each application (1s. post free) can be obtained from Mr. G. Cole Deacon, Secretary, Rates and Charges Committee, 35, Parliament Street, S.W.1. Notices of objection must be filed with the Registrar of the Tribunal, Bush House, Aldwych, W.C.2, and a copy of each objection sent to Mr. Cole Deacon on or before June 30.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 23rd Week			Totals to Date		
	1936	1935	Inc. or Dec.	1936	1935	Inc. or Dec.
	£	£	£	£	£	£
L.M.S.R. (6,917 mls.)						
Passenger-train traffic	543,000	610,000	— 67,000	9,745,000	9,636,000	+ 109,000
Merchandise, &c.	396,000	459,000	— 63,000	10,797,000	10,303,000	+ 494,000
Coal and coke	151,000	225,000	— 74,000	5,764,000	5,615,000	+ 149,000
Goods-train traffic	547,000	684,000	— 137,000	16,561,000	15,918,000	+ 643,000
Total receipts	1,090,000	1,294,000	— 204,000	23,306,000	25,554,000	+ 752,000
L.N.E.R. (6,332 mls.)						
Passenger-train traffic	370,000	382,000	— 12,000	6,369,000	6,301,000	+ 68,000
Merchandise, &c.	263,000	296,000	— 33,000	7,372,000	7,151,000	+ 221,000
Coal and coke	161,000	214,000	— 53,000	5,470,000	5,292,000	+ 178,000
Goods-train traffic	424,000	510,000	— 86,000	12,842,000	12,443,000	+ 399,000
Total receipts	794,000	892,000	— 98,000	19,211,000	18,744,000	+ 467,000
G.W.R. (3,746½ mls.)						
Passenger-train traffic	214,000	246,000	— 32,000	4,066,000	4,037,000	+ 29,000
Merchandise, &c.	157,000	190,000	— 33,000	4,263,000	4,126,000	+ 137,000
Coal and coke	56,000	95,000	— 39,000	2,373,000	2,351,000	+ 22,000
Goods-train traffic	213,000	285,000	— 72,000	6,636,000	6,477,000	+ 159,000
Total receipts	427,000	531,000	— 104,000	10,702,000	10,514,000	+ 188,000
S.R. (2,154 mls.)						
Passenger-train traffic	321,000	372,000	— 51,000	6,121,000	6,073,000	+ 48,000
Merchandise, &c.	48,500	56,000	— 7,500	1,383,500	1,384,500	— 1,000
Coal and coke	15,500	20,000	— 4,500	759,500	714,500	+ 45,000
Goods-train traffic	64,000	76,000	— 12,000	2,143,000	2,099,000	+ 44,000
Total receipts	385,000	448,000	— 63,000	8,264,000	8,172,000	+ 92,000
Liverpool Overhead (6½ mls.)	1,387	1,184	+ 203	25,987	25,641	+ 346
Mersey (4½ mls.)	4,028	3,778	+ 250	93,692	92,608	+ 1,084
*London Passenger Transport Board	591,800	560,000	+ 31,800	26,776,900	26,407,300	+ 369,600
IRELAND						
Belfast & C.D. pass. (80 mls.)	2,632	2,496	+ 136	43,787	45,436	— 1,649
,, ,, goods	535	379	+ 156	12,443	11,391	+ 1,052
,, ,, total	3,167	2,875	+ 292	56,230	56,827	— 597
†Great Northern pass. (543 mls.)	11,750	9,800	+ 1,950	190,000	183,250	+ 6,750
,, ,, goods	6,250	6,800	— 550	216,350	206,550	+ 9,800
,, ,, total	18,000	16,600	+ 1,400	406,350	389,800	+ 16,550
†Great Southern pass. (2,076 mls.)	40,436	33,386	+ 7,050	653,826	641,214	+ 12,612
,, ,, goods	35,603	36,966	— 1,363	914,611	866,621	+ 47,990
,, ,, total	76,039	70,352	+ 5,687	1,568,437	1,507,835	+ 60,602

* 49th week, the receipts for which include those undertakings not absorbed by the L.P.T.B. in the corresponding period last year; last year's figures are, however, adjusted for comparative purposes.
† 22nd week. Whit-Monday, 1936, Whitsuntide bookings, 1935.

British and Irish Railways Stocks and Shares

Stocks	Highest 1935	Lowest 1935	Prices June 10, 1936	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	55½	44½	47½	—
5% Con. Prefce. ...	124	108	119½	−1
5% Red. Pref. (1950)	117	106¾	111½	—
4% Deb.	118½	108	115	−½
4¼% Deb. ...	122	110	118½	—
4½ Deb.	129½	118	126½	−1
5% Deb.	140¼	130	139½	—
2½% Deb. ...	82¼	68½	78	—
5% Rt. Charge ...	137	128	134½	−1
5% Cons. Guar. ...	136¾	120½	131½	—
L.M.S.R.				
Ord.	25 5/16	16	22½	−½
4% Prefce. (1923)	58¼	43½	69	−½
4% Prefce. ...	87½	73½	86	−½
5% Red. Pref. (1955)	107	97¾	107½	—
4% Deb.	110¼	99½	108*	−2
5% Red. Deb. (1952)	119 11/16	111 5/16	116½	—
4% Guar. ...	105⅝	95½	104	−½
L.N.E.R.				
5% Pref. Ord. ...	15⅞	8¼	10	—
Def. Ord.	7 9/16	4¾	5	−⅛
4% First Prefce.	7¾	4⅞	6⅞	−½
4% Second Prefce.	3⅛	1⅝	2⅝	−½
5% Red. Pref. (1955)	92¼	71	94½	—
4% First Guar. ...	103 11/16	93	101	−½
4% Second Guar.	98¾	82½	96	−½
3% Deb.	86	75	83*	−2
4% Deb.	109¼	98½	107*	−2
5% Red. Deb. (1947)	118¼	106½	112½	—
4½% Sinking Fund Red. Deb.	112½	108	108*	−2
SOUTHERN				
Pref. Ord. ...	87½	69⅜	92	−1
Def. Ord.	25 13/16	16¾	22½	−½
5% Prefce. ...	124	108¼	122	−½
5% Red. Pref. (1964)	117¾	109½	118½	—
5% Guar. Prefce.	136½	121½	131½	—
5% Red. Guar. Pref. (1957)	121¼	112½	119½	+1½
4% Deb.	116¾	107	111½*	−2
5% Deb.	138	130¼	136½*	−2
4% Red. Deb. 1962–67	115	106½	113*	−2½
BELFAST & C.D.				
Ord.	9	4	6	—
FORTH BRIDGE				
4% Deb.	111¼	104¼	104½*	−1
4% Guar.	109⅞	104	104½*	−2
G. NORTHERN (IRELAND)				
Ord.	20	7	17	—
G. SOUTHERN (IRELAND)				
Ord.	57½	14½	59½	—
Prefce.	50	25¼	61	+½
Guar.	88¾	51¼	87½	—
Deb.	86¼	70	88¾	−2¼
L.P.T.B.				
4½% "A" ...	130	119¾	123½*	−2
5% "A" ...	139¾	130	133½*	−2
4½% "T.F.A." ...	113¾	108	109	—
5% "B" ...	131½	122¾	127*	−2
"C"	109½	91	102	—
MERSEY				
Ord.	23⅛	9¼	26½	—
4% Perp. Deb. ...	100½	93½	99½	—
3% Perp. Deb. ...	75½	67	76	—
3% Perp. Prefce.	62	47¼	64½	—

* ex dividend.

LEGAL AND OFFICIAL NOTICES

In the Court of the Railway Rates Tribunal.

Road and Rail Traffic Act, 1933. Agreed Charges.

NOTICE IS HEREBY GIVEN that Applications for the approval of Agreed Charges under the provisions of Section 37 of the Road and Rail Traffic Act, 1933, short particulars of which are set out in the Schedule hereto, have been lodged with the Railway Rates Tribunal.

The said Applications may be inspected at the Office of the Tribunal, Bush House, Aldwych, London, W.C.2, at any time during office hours and at the following places:—

LONDON: Railway Clearing House, 123, Seymour Street, N.W.1.
BIRMINGHAM: District Goods Manager's Office, Snow Hill, Great Western Railway.
CARDIFF: Divisional Superintendent's Office, Great Western Railway.
EXETER: Western Divisional Superintendent's Office, Southern Railway.
LEEDS: District Goods Manager's Office, Wellington Street, London & North Eastern Railway.
LEICESTER: District Goods and Passenger Manager's Office, London Midland & Scottish Railway.
MANCHESTER: District Goods Manager's Office, Hunt's Bank, London Midland & Scottish Railway.
SOUTHAMPTON: Southern Divisional Superintendent's Office, Southampton Central, Southern Railway.
YORK: Goods Manager's Office, London & North Eastern Railway.
ABERDEEN: District Goods and Passenger Manager's Office, London Midland & Scottish Railway.
EDINBURGH: District Goods and Passenger Manager's Office, Waverley Station, London & North Eastern Railway.
GLASGOW: Commercial Manager's Office, Central Station, London Midland & Scottish Railway.

A copy of each Application lodged with the Tribunal can be obtained from Mr. G. Cole Deacon, Secretary, Rates and Charges Committee, 35, Parliament Street, Westminster, London, S.W.1, price 1s., post free.

Notices of objection by any parties entitled to object to the approval of any of the said Agreed Charges must state concisely the grounds of objection and must be filed at the office of the Registrar, Bush House, Aldwych, London, W.C.2, on or before the 30th day of June, 1936, and a copy thereof on or before the same day served on or sent by registered post to Mr G. Cole Deacon, at the above address. A separate Notice must be filed and served in respect of each Application.

Each Notice filed must be on foolscap size paper and must be stamped with an adhesive fee stamp for 2s. 6d. (which can be purchased at the office of the Tribunal only). If sent by post for filing each Notice must be accompanied by a Postal Order for 2s. 6d. payable to the Registrar when a stamp will be affixed at the office. A Notice by a Representative Body of Traders must contain a statement of the facts upon which such Body claims to represent a substantial number of traders interested in, or likely to be affected by the decision on, the application.

Five additional copies of each Notice must be lodged with the original at the office of the Registrar.

T. J. D. ATKINSON,
Registrar.

4th June, 1936.

Number of Application and Date of Lodgment	Parties to Agreement	Nature of Agreed Charge
1936. No. 268—May 27, 1936	A. W. ABRAHAM & CO. LTD., Newport, Isle of Wight (*Registered Bacon Curer*), and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos. and L.P.T.B. *This Application, by leave granted under Rule 4, relates also to Agreed Charges with five other Registered Bacon Curers in Great Britain as specified therein.*	Per Live Pig. Live Pigs consigned to the Traders or their Agents.
1936. No. 269—May 28, 1936	JAMES AIKMAN & SONS, 43–53, Jeffrey Street, Edinburgh, 1, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Boots and Shoes; Empties returned to Suppliers.
1936. No. 270—May 28, 1936	THE BRITISH G.W.Z. BATTERY CO. LTD., Falmouth Road, Trading Estate, Slough, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos. and L.P.T.B. *Applicable also to traffic consigned to two Associated or Subsidiary Companies.*	Per ton. Empties returned to the Trader.
1936. No. 271—May 28, 1936	E. K. COLE LIMITED, Ecko Works, Southend-on-Sea, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Wireless Receivers and Apparatus; Radiograms; Bakelite Mouldings; Wooden and Chromium Plated Stands; Advertising Matter; Empties returned to Suppliers.
1936. No. 272—May 28, 1936	IAN D. GOLDSWORTH & CO., Cornboro' Place, Bridgwater, Somerset, and the G.W. Railway Co. and the Somerset and Dorset Joint Committee.	Per ton. Woven Fabric Furniture and Wickerwork.
1936. No. 273—May 28, 1936	THE KIDMAR HOSIERY COMPANY, 388, Swanson Street, Bridgeton, Glasgow, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Hosiery; Empties returned to Suppliers.
1936. No. 274—May 28, 1936	MELTONIAN (E. BROWN & SON) LTD., Meltonian Works, Oxgate Lane, Cricklewood, N.W.2, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Polishes, Dyes, Stains, Dressings and Compositions; Rubber Brushes; Tinplate Scrap, Advertising Material; Empties returned to Suppliers.
1936. No. 275—May 28, 1936	SMITH HAYDEN & CO. LTD., Cambrian Works, Croydon Road, Beckenham, Kent, and the Southern Railway Co.	Per ton. Confectionery; Nut Kernels; Fondant Sugar; Lemon Curd.
1936. No. 276—May 28, 1936.	JOHN WHITE & CO. (BRISTOL) LTD., 107–108, Thomas Street, Bristol, 1, and the G.W. and L.M. & S. Railway Cos.	Per ton. Bacon and Hams; Butter; Cheese; Lard; Preserves in tins.
1936. No. 277—May 28, 1936	CARLTONA LIMITED, Victoria Road, Willesden Junction, London, N.W.10, and the G.W., L.M. & S., L. & N.E. and Southern Railway Cos.	Per ton. Confectionery; Groceries; Empties returned to Suppliers.
1936. No. 278—May 28, 1936	J. G. GRAVES LIMITED, Sheffield, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Furniture, General Stores Wares; Empties returned to Suppliers.
1936. No. 279—May 28, 1936	F. C. LOWE & SON LTD., "Carta Carna" Works, Sittingbourne, and the Southern Railway Co.	Per ton. Dog Biscuits and Foods for Livestock or Poultry.
1936. No. 280—May 28, 1936	MALGA (LONDON) LIMITED, Southall, Middlesex, and the G.W. Railway Co.	Per ton. Confectionery and Fondant Sugar.
1936. No. 281—May 28, 1936	NEWTON CHAMBERS & CO. LTD., Thorncliffe, near Sheffield, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Disinfectant, Fumigating Pastilles; Soap, Spraying Machines, &c., Advertising Matter; Empty tins, drums and bottles; Toilet Paper.
1936. No. 282—May 28, 1936	JOHN NOBLE LIMITED, Brook Street, Manchester, and the Cheshire Lines Committee and the G.W., L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing, Drapery and General Stores Wares.
1936. No. 283—May 28, 1936	CAMPBELLS AND STEWART & McDONALD LIMITED, 137, Ingram Street, Glasgow, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing, Drapery and Millinery.
1936. No. 284—May 28, 1936	KELLETT, WOODMAN & CO. LTD., 44, Union Street, Bradford, Yorks, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Textiles.
1936. No. 285—May 28, 1936	KIDMAR HOSIERY COMPANY, 388, Swanston Street, Bridgeton, Glasgow, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Hosiery and Knitted Woollen Goods.
1936. No. 286—May 28, 1936	EMPIRE STORES LIMITED, Canal Road, Bradford, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing, Drapery and General Stores Wares.
1936. No. 287—May 28, 1936	J. G. GRAVES LIMITED, Sheffield, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing, Drapery and General Stores Wares.
1936. No. 288—May 28, 1936	R. & J. HILL LIMITED, Spinet House, 175, Shoreditch, London, E.1, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per package. Cigarettes and Tobacco.
1936. No. 289—May 28, 1936	WILLIAM HOLLINS & CO. LTD., Viyella House, Nottingham, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Garments, Hosiery, Knitting Yarn, Piece Goods and Advertising Matter.
1936. No. 290—May 28, 1936	INTERNATIONAL HARVESTER COMPANY OF GREAT BRITAIN LIMITED, Harvester House, 259, City Road, London, E.C.1, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per package. Small parts of Agricultural Machinery and of Motor Trucks; Advertising Matter.
1936. No. 291—May 28, 1936	GORDON MACKAY & CO. (LEEDS) LTD., Gomaco House, Armley Road, Leeds, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing, Drapery and General Stores Wares.
1936. No. 292—May 28, 1936	I. E. TRENT & CO. LTD., 10, Oat Lane, Wood Street, London, E.C.2, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per package. Textiles.
1936. No. 293—May 28, 1936	BROWN, MUFF & CO. LTD., Bradford, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing, Drapery and General Stores Wares.
1936. No. 294—May 28, 1936	COOK, SON & CO. (ST. PAULS) LTD., 22, St. Pauls Church Yard, London, E.C.4, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Bedding, Cushions, Drapery, Millinery, Umbrellas; Mats and Matting, Oilcloth; Chairs (common folding); Empties returned to Suppliers.
1936. No. 295—May 28, 1936	AVANA CAKES LIMITED, Cardiff, and the G.W. and L.M. & S. Railway Cos.	Per ton. Slab Cake and Sponge Cake.
1936. No. 296—May 28, 1936	THE GREAT UNIVERSAL STORES LIMITED, Devonshire Street, Ardwick, Manchester, and the Cheshire Lines Committee and the G.W., L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing, Drapery and General Stores Wares, in packages exceeding 3 lb., but not exceeding 18 lb. each in weight.

Legal and Official Notices—*continued*

Number of Application and Date of Lodgment	Parties to Agreement	Nature of Agreed Charge
	Applicable also to traffic consigned by five Associated or Subsidiary Companies.	
1936. No. 297—May 28, 1936	HARRIS & CO. (CONFECTIONERS) LTD., Bryanston House, Lomond Grove, London, S.E.5, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Biscuits, Cake, Dried Fruits and Shelled Nuts (used in connection with the business of a Confectioner), Margarine and similar compounds, Marzipan, Fondant Sugar, Baking Powder, Block Chocolate, Cocoa and Jam in tins.
1936. No. 298—May 28, 1936	J. PULLAR & SONS LTD., Perth, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos. and L.P.T.B.	Per package. (i) Dyed and Cleaned Goods. (ii) Goods for Dyeing and Cleaning.
	Applicable also to traffic consigned by one Associated or Subsidiary Company.	
1936. No. 299—May 28, 1936	W. WILLIAMS & SON (BREAD STREET) LTD., 53 and 54, Bread Street, London, E.C.4, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per package. Belts, Braids, Buttons, Fancy Handkerchiefs, Feather Neckwear, Fringes, Furs, Fur Coats, Haberdashery, Knitted Sports Wear, Ladies' Hand Bags and Trimmings.

H.E.H. The Nizam's State Railway

APPLICATIONS are invited for the post of Assistant Locomotive Superintendent for H.E.H. the Nizam's State Railway, Hyderabad State, India.

Qualifications :

1. Age not less than 25 years.
2. A good general education.
3. An apprenticeship of at least five years in the workshops of a leading British Railway or with a well-known firm of locomotive builders.
4. At least three years' subsequent experience in either the drawing office, progress office or in some workshop supervisory capacity, supernumerary or otherwise. At least one year's drawing office experience preferred.
5. Should preferably have passed the qualifying examination for A.M.I.Mech.E. or A.M.I.C.E., or possess a certificate exempting from such qualifying examination.

Salary : Will be payable in the currency of the Hyderabad State* in the grade of O.S. Rs. 400—30—700, at a commencing salary according to age, qualifications and experience.

Applications (by letter only) giving full details of qualifications, age, training and experience, whether married or single, and accompanied by copies of testimonials, should be addressed to the undersigned not later than 17th June, 1936.

F. ADAMS,
Secretary.

H.E.H. the Nizam's State Railway Board,
269, Winchester House,
Old Broad Street, E.C.2.
10th June, 1936.

* The Hyderabad State currency usually varies from Oosmania Sicca (O.S.) rupees 114 to 117 per hundred British India rupees.

THE Proprietors of Patent No. 390,953 for Improvements in or relating to Wheels, especially for Railway and other Similar Vehicles, are desirous of entering into arrangements by way of licence and otherwise on reasonable terms for purpose of exploiting same and ensuring its full development and practical working in this country. All communications should be addressed in first instance to: HASELTINE LAKE & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

Port of London Authority

THE Port of London Authority are prepared to receive applications from gentlemen fully qualified to act as Assistant to their Chief Engineer, with prospects of promotion.

Applications, in envelope marked "Engineer," giving full particulars of age, experience and qualifications, should be addressed to the General Manager, Port of London Authority, London, E.C.3, and delivered not later than Friday, the 17th of July, 1936.

J. D. RITCHIE,
Secretary.

2nd June, 1936.

THE MADRAS & SOUTHERN MAHRATTA RAILWAY COMPANY LIMITED invite Tenders for :—

250 STEEL AXLES FOR CARRIAGES AND WAGONS.

Specification and Form of Tender can be obtained at the Company's Offices, 25, Buckingham Palace Road, Westminster, S.W.1.

Fee ONE GUINEA, *which will not be returned.*

Tenders must be submitted not later than 2 o'clock p.m. on TUESDAY, 30TH JUNE, 1936.

The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right of reducing or dividing the order.

By Order of the Board,
G. W. V. DE RHE PHILIPE,
Secretary.

WANTED.—Experienced Railway Rolling Stock Draughtsman. Must be thoroughly conversant with R.C.H. Regulations. Apply stating age, previous experience, and salary required to Managing Director, CHARLES ROBERTS & Co. LTD., Horbury Junction, near Wakefield.

APPLICATIONS WANTED for post of Traffic Assistant on railway in India. Salary offered Rs. 450, 475, 500, 550, 600 a month; free bungalow, medical attendance and provident fund. Applicants should be public school men, under 26, with railway experience.—Write to "C. E.," c/o J. W. VICKERS & Co. LTD., 24, Austin Friars, E.C.2.

Bengal-Nagpur Railway Company Limited

THE Directors are prepared to receive Tenders for :—

FIVE BOILERS FOR F.T.S. CLASS TANK ENGINES.

Specification and Form of Tender can be obtained at the Company's Offices, 132, Gresham House, Old Broad Street, London, E.C.2, on or after Monday, 8th June, 1936.

A fee of 20s. will be charged for each copy of the Specification, which is *NOT* returnable.

Tenders must be submitted not later than Noon on Tuesday, 23rd June, 1936.

The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right of reducing or dividing the order.

By Order of the Board,
T. R. WYNNE,
Managing Director.

Bengal-Nagpur Railway Company Limited

THE Directors are prepared to receive Tenders for :—

SPRING HANGERS, SHACKLES, &c., FOR BOGIE RAIL WAGONS.

Specification and Form of Tender can be obtained at the Company's Offices, 132, Gresham House, Old Broad Street, London, E.C.2, on or after Thursday, 11th June, 1936.

A fee of 20s. will be charged for each copy of the Specification, which is *NOT* returnable.

Tenders must be submitted not later than Noon on Wednesday, 24th June, 1936.

The Directors do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right of reducing or dividing the order.

By Order of the Board,
T. R. WYNNE,
Managing Director.

WANTED for metre-gauge railway in India, Civil Engineer; salary for five years' agreement Rs. 600 per month rising by Rs. 50 annually; free bungalow, medical attendance and provident fund. Applicants should be public school men, with railway experience, and not more than 25 years of age.—Write to "L. B." c/o J. W. VICKERS & Co. LTD., 24, Austin Friars, E.C.2.

QUESTIONS IN PARLIAMENT

Fares and Tickets

Mr. Kelly, on May 27, asked the Minister of Transport if any reply had been made to the appeal on behalf of young people for lower fares on the railways in the London area when going to and from work.

Mr. Hore-Belisha.—Yes, sir, and the reply was to the effect that jurisdiction in this matter rests not with me but with the Railway Rates Tribunal.

Mr. Daniel Somerville, on May 29, asked the Minister of Transport whether, in view of the confusion which existed in the minds of the public as to the rules and regulations governing the issue of railway tickets, he would request the railway companies to give adequate publicity to the fact that tickets must in all cases be personally bought by those intending to use them.

Mr. Hore-Belisha.—The byelaws of the main line companies provide that "no person shall enter any carriage . . . for the purpose of travelling unless and until he or someone on his behalf shall have obtained . . . . a ticket."

L.P.T.B. Capital

Mr. Gallacher asked the Minister of Transport what was the amount allowed for expenditure on or provisions for maintenance and renewal of the undertaking before the estimated net revenue of £5,798,602 was arrived at in Sir William McLintock's *pro forma* statement (Cmd. 4204, 1932) in connection with the London Passenger Transport Bill.

Capt. A. Hudson.—I am informed that the amount allowed by Sir William McLintock for expenditure on maintenance and provisions for renewal in his *pro forma* statement was £7,296,059.

Level Crossings

Mr. McEntee (Walthamstow) on June 10 asked the Minister of Transport if he would state the number of level crossings that had been abolished during the past 12 months; and the cost.

Mr. Hore-Belisha: During the past 12 months three level crossings have been abolished and four other crossings, although not closed, can now be avoided by through traffic owing to the construction of bridges on by-pass roads. The total cost was £403,580. In the same period I have made grants to schemes estimated to cost £249,513 which will, in due course, enable two level crossings to be closed and two others avoided.

Railway Share Market

Partly owing to the commencement of a new Stock Exchange account, and partly as a result of the favourable influence on sentiment of the lower unemployment figures, most sections of the stock and share market have been more active. Although the past week's traffics were regarded as slightly disappointing, Home railway stocks benefited from the rather better general market conditions and made fractional improvement in some cases, buyers being more in evidence on the view that now negotiations on the wages claim are in hand, prices may maintain a better tendency on the belief that a good rally can be expected if there is a reasonably satisfactory settlement of the wages question.

L.M.S. ordinary was particularly good earlier in the week and is ¼ better at 22⅞, while both the 4 per cent. and 1923 preference received attention on their apparently attractive yields. For the current year to date the railway's traffic receipts have increased by the very encouraging amount of £752,000. Southern deferred improved later to 22¾ and the preferred made a larger gain to 92½. To date the increase in traffics is £92,000, which in itself does not hold out much prospect of a resumption of dividends on the deferred stock, but the disposition in the market is to assume that traffics may be accelerated during the second half of the year.

L.N.E.R. second preference stock made the improved price of 25 and fractional gains were also established by the preferred and deferred stocks. In this case the gain in traffics for the year so far amounts to £467,000. Great Western was steadier, aided by the belief that there seem reasonably good prospects for budgeting for the maintenance of the dividend at 3 per cent., although unless there is marked improvement in the rate of traffic increases during the rest of the year, payment of a dividend at this rate would only be possible by a further withdrawal from reserve. Debentures and guaranteed stocks were firmer in sympathy with the improvement in British Government securities.

Foreign railway stocks showed no decided trend. The chief feature among Argentine stocks was improvement in B.A. Gt. Southern ordinary and 6 per cent. preference. The latter put on two points to 38. Debenture stocks of the Argentine railways generally were easier for choice, but Cordoba Central first debentures were moderately better. Central Argentine issues were out of favour, despite the fairly hopeful views expressed at the recent meeting. Antofagasta was lowered following the meeting. San Paulo and Leopoldina declined. Canadian Pacific did not hold best prices, but the general trend in American railroad stocks was firmer.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1935-36	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1935	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1935	Prices: Lowest 1935	Prices: June 10, 1936	Prices: Yield % (See Note)
				£	£		£	£	£					
South & Central America.	Antofagasta (Chili) & Bolivia	834	7.6.36	13,310	+ 540	23	308,830	284,980	+ 23,850	Ord. Stk.	23	14 15/16	19	Nil
	Argentine North Eastern ..	753	6.6.36	10,029	+ 1,671	49	391,980	367,221	+ 24,759	,,	7	4	4 1/2	Nil
	Argentine Transandine ..	—	—	—	—	—	—	—	—	A. Deb.	49 1/2	30	47 2/8	8 7/16
	Bolivar	174	May, 1936	7,900	+ 800	22	34,800	33,400	+ 1,400	6 p.c. Deb.	13	5	10	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	14	11	17 1/2	2 7/8
	Buenos Ayres & Pacific ..	2,806	6.6.36	83,666	— 5,269	49	4,173,835	3,911,611	+ 262 224	Ord. Stk.	10 1/2	4 7/8	8	Nil
	Buenos Ayres Central ..	190	30.5.36	$85,800	— $29,300	48	$5,121,660	$5,291,000	— $169,340	Mt. Deb.	21	10	16 1/2	Nil
	Buenos Ayres Gt. Southern	5,084	6.6.36	120,564	— 8,159	49	6,353,211	7,016,198	— 662,987	Ord. Stk.	27	13 1/2	15 1/2	Nil
	Buenos Ayres Western ..	1,930	6.6.36	39,659	— 13,313	49	2,224,115	2,233,564	— 9,449	,,	24	10	13	Nil
	Central Argentine	3,700	6.6.36	109,656	— 15,020	49	5,756,574	5,971,101	— 214,527	,,	17 7/8	7	10	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	9	3 1/4	6 1/2	Nil
	Cent. Uruguay of M. Video	273	30.5.36	10,277	— 423	48	534,417	650,236	— 115,819	Ord. Stk.	8 1/2	3	4	Nil
	Do. Eastern Extn.	311	30.5.36	2,493	+ 641	48	99,975	93,322	+ 6,653	—	—	—	—	—
	Do. Northern Extn.	185	30.5.36	1,761	+ 31	48	71,019	54,389	+ 16,630	—	—	—	—	—
	Do. Western Extn...	211	30.5.36	825	+ 189	48	42,045	36,238	+ 5,807	—	—	—	—	—
	Cordoba Central	1,218	6.6.36	32,370	+ 2,060	49	1,363,890	1,373,260	— 9,370	Ord. Inc.	4	1	1 1/2	Nil
	Costa Rica	188	Apr., 1936	15,044	+ 1,999	43	142,473	162,371	— 19,898	Stk.	35	30	36	5 9/16
	Dorada	70	Apr., 1936	13,600	+ 2 900	17	52,100	44,100	+ 8,000	1 Mt. Db.	103 5/8	102 1/2	104 1/2	5 5/4
	Entre Rios	810	6.6.36	12,115	+ 114	49	526,973	593.216	— 66,243	Ord. Stk.	15	6 1/2	8 1/2	Nil
	Great Western of Brazil ..	1,082	6.6.36	5,700	+ 500	23	188,400	196,200	— 7,800	Ord. Sh.	1/2	5/16	1/2	Nil
	International of Cl. Amer.	794	Apr., 1936	$517,563	+ $61,587	17	$2,080,670	$1,763,589	+ $317,081	—	—	—	—	—
	Interoceanic of Mexico ..	—	—	—	—	—	—	—	—	1st Pref.	1/2	5/32	1/2	Nil
	La Guaira & Caracas ..	22¾	May, 1936	5,505	+ 1,075	22	22,880	19,930	+ 2,950	Stk.	8 1/2	8	8 1/2	Nil
	Leopoldina	1,918	6.6.36	16,999	+ 5,587	23	386,654	359,839	+ 26,815	Ord. Stk.	8 1/2	2 1/2	7	Nil
	Mexican	483	21.5.36	$304,400	+ $22,700	20	$5,310,300	$4,936,700	+ $373,600	,,	1 1/2	1/4	5/4	Nil
	Midland of Uruguay ..	319	Apr., 1936	7,396	+ 1,035	43	72,302	99,749	— 27,447	,,	1 1/2	1 1/2	1 1/2	Nil
	Nitrate	401	31.5.36	3,705	— 87	22	61,734	58,925	+ 2,809	Ord. Sh.	64/—	42/—	2 1/4	Nil
	Paraguay Central	274	6.6.36	$2,812,000	+ $1,231,000	49	$108,584,400	$58,340,000	+ $50,244,000	Pr. Li. Stk.	80 1/2	60	77	7 15/16
	Peruvian Corporation ..	1,059	May, 1936	79,746	+ 7,931	48	866,369	697,276	+ 169,093	Pref.	10 5/8	6 7/16	11	Nil
	Salvador	100	30.5.36	¢17,200	— ¢4,550	48	¢937,646	¢1,010,577	— ¢72,931	Pr. Li.Db.	65	61	55	9 1/16
	San Paulo	153¼	31.5.36	33,458	+ 6,703	22	645,659	495,322	+ 150,337	Ord. Stk.	80	35	55 1/2	4 1/2
	Taltal	164	May, 1936	3,010	+ 330	48	38,505	34,065	+ 4,440	Ord. Sh.	11 1/16	11/8	1	10
	United of Havana	1,353	6.6.36	20,997	+ 911	49	1,172,224	1,139,107	+ 33,117	Ord. Stk.	3 1/16	1	3	Nil
	Uruguay Northern	73	Apr., 1936	854	— 20	43	8,303	10,862	— 2,559	Deb. Stk.	4 1/2	2 15/16	4 1/2	Nil
Canada.	Canadian National	23,618	31.5.36	978,763	+ 62,600	22	14,144,332	13,285,943	+ 858,389	—	—	—	—	—
	Canadian Northern ..	—	—	—	—	—	—	—	—	4 p.c. Perp. Dbs.	78 5/8	52 1/2	67 1/2 5/8	5 5/16
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	103 5/8	93	101 1/2	3 5/16
	Canadian Pacific	17,237	31.5.36	676,000	+ 16,400	22	10,217,200	9,267,800	+ 949,400	Ord. Stk.	14 1/16	8 5/4	12 1/2	Nil
India.†	Assam Bengal	1,329	20.5.36	34,117	+ 1,242	8	166,957	163,886	+ 3,071	Ord. Stk.	92 1/8	77 1/2	85 1/2	3 1/2
	Barsi Light	202	10.5.36	3,367	— 353	6	15,022	16 185	— 1,163	Ord. Sh.	105	77 1/2	72 1/2	6 7/8
	Bengal & North Western ..	2,112	20.5.36	84,007	+ 891	8	416,361	400,099	+ 16,262	Ord. Stk.	30 1/2	29 1/4	31 1	5 1/8
	Bengal Dooars & Extension	161	10.5.36	3,150	+ 3	6	11,929	12,648	— 719	,,	127 1/2	122	125 1/2	5 9/16
	Bengal-Nagpur	3,268	20.5.36	177,675	— 23,615	8	898,425	950,828	— 52,403	,,	105	100 5/16	102 1/2 5/8	3 7/8
	Bombay, Baroda & Cl. India	3,072	31.5.36	269,925	+ 1,875	9	1,640,400	1,503,075	+ 137,325	,,	115 1/4	110	113 1/2	5 5/16
	Madras & Southern Mahratta	3,230	20.5.36	171,825	— 651	8	848,100	820,554	+ 27,546	,,	128 1/2	113 7/8	112 1/2	8
	Rohilkund & Kumaon ..	572	20.5.36	17,679	+ 2,889	8	89,719	83,244	+ 6,475	,,	294	262	305 1/2	5 1/4
	South India	2,531	20.5.36	111,258	— 5,167	8	565,342	581,456	— 16,114	,,	119 5/4	104 1/4	103 1/2 5/8	5 5/16
Various.	Beira-Umtali	204	Mar., 1936	66,055	— 7,592	26	382,261	378,782	+ 3,479	—	—	—	—	—
	Bilbao River & Cantabrian	15	May, 1936	1,065	— 428	22	7,128	8,644	— 1,516	—	—	—	—	—
	Egyptian Delta	622	20.5.36	5,689	+ 782	8	28,015	26,056	+ 1,959	Prf. Sh.	2	15/8	1 1/4	5 11/16
	Great Southern of Spain ..	104	30.5.36	1,295	— 393	22	24,438	41,745	— 17,307	Inc. Deb.	3 1/2	2	3 1/2	Nil
	Kenya & Uganda	1,625	Apr., 1936	245,898	+ 21,313	17	987,690	928,532	+ 59,158	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	48	—	36	43 8 1/8
	Mashonaland	913	Mar., 1936	99,158	— 19,369	26	608,956	687,786	— 78,830	1 Mg. Db.	104 1/4	100	103	4 7/8
	Midland of W. Australia ..	277	Apr., 1936	12,597	+ 36	43	137,461	134,787	+ 2,674	Inc. Deb.	98 5/4	93	93 1/2 5/8	5 5/16
	Nigerian	1,905	25.4.36	30,179	+ 9,451	4	122,352	108 237	+ 14,115	—	—	—	—	—
	Rhodesia	1,538	Mar., 1936	181,740	— 24,323	26	1,117,186	1,138,252	— 21,066	4 p.c. Db.	105 1/2	101	105	3 13/16
	South African	13,264	16.5.36	582,681	+ 47,820	7	3,889,035	3,580,116	+ 308,919	—	—	—	—	—
	Victoria	4,728	Dec., 1935	866,995	— 3 320	26	4,826 292	4,751,974	+ 74,318	—	—	—	—	—
	Zafra & Huelva	112	Apr., 1936	9,003	— 2,584	17	39,754	44,550	— 4,796	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/10.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate o fexchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rates of exchange and not on the par value.

Diesel Railway Traction

Diesel Traction for Suburban Service

IT is often said that for suburban work diesel traction cannot be considered as a practical proposition. But everything is a matter of degree and while nobody would dream of applying diesel units to the services operated out of Liverpool Street station, to quote one example, there are numerous large towns where the suburban requirements do not call for electrification, but could be met quite easily with diesel units. Some time ago the Great Northern Railway of Ireland began the first intensive diesel service in the British Isles with two cars coupled together on the Dublin-Howth line. The same company is now inaugurating similar services out of the Great Victoria Street terminus in Belfast and from Amiens Street in Dublin with two triple-car articulated trains, the centre vehicle of which is occupied by the motive power equipment and luggage room. Compared with the traffic density found on the suburban lines leading out of London, the Irish services are not onerous, and the power ratios therefore are not as high as one might expect for a type of traffic for which high acceleration rates generally are postulated. The b.h.p. per ton of tare is 3·8 and per ton of gross weight 3·0 ; the weight per seat is 590 lb. and the b.h.p. per seat 0·95. With such values it is not to be expected that acceleration rates of the order of 1·0 m.p.h.p.s. will be achieved, but there is every expectation that the performance of the present push-and-pull steam trains will be exceeded in conjunction with a lower operating cost. Moreover, the power capacity is a good deal more than found on the Dublin-Howth cars, for on that branch it has been the practice to run two 15-ton cars coupled together, but with only one of the two 102 b.h.p. engines at work, the ratios thus being 3·4 b.h.p. per ton of tare and 2·8 b.h.p. per ton of gross weight.

Local Railcars in France

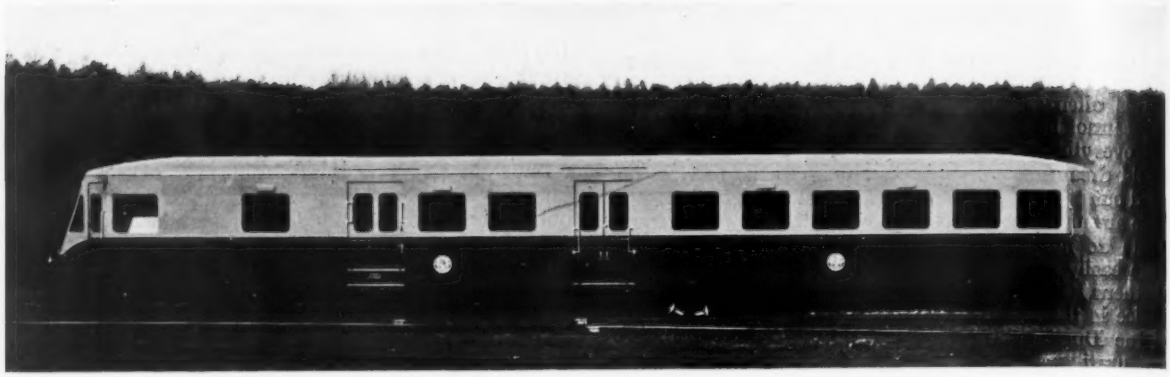
THE very great mileage (something like 40,000) worked every day by diesel railcars in France, is not confined to the lines of the six big systems. Several of the smaller railways, such as the North-East Secondary, the Provençal, and the lines of the Chemins de fer Economiques operate a large percentage of their mileage by a railcar traction; and in some cases, at least, they make a point of telling the public about it, because great accelerations have been made possible by the substitution of railcars for steam trains. For instance, in the Gironde system of the Chemins de fer Economiques accelerations of 30 min. have been made on a steam timing of 126 min., but over shorter distances, *e.g.*, between St. Symphorien and Nizan, 12 miles, the accelerations have been remarkable, gains of 17 min. on a steam time of 43 min. and 31 min. on a time of 53 min. having been effected. These cuts are due partly to the more rapid acceleration of the railcar and partly to the fact that goods traffic is dealt with now by one or two trains in each direction daily in place of the old mixed trains which shunted wagons at each stop. The whole method of operating these small railways has thus been changed to take advantage of the characteristics of the railcar, and judging by the illustrations and notices which the railway companies' bills and placards give to the *trains automotrices*, they are proving very popular with travellers. Generally the cars on these lines are of the 100 b.h.p. Renault, De Dion Bouton, and Brissoneau-Lotz four-wheeled types seating 40 to 45 passengers, and with a small amount of space for parcels and luggage. Parcels traffic appears to be a thriving side of the business. These cars run very steadily on the straight at 40-45 m.p.h., but thence up to 50 m.p.h. (the maximum speed) the riding is not always quite so good. So far as we could ascertain the running costs for a yearly mileage of 40,000 average 4½d. to 5d. per car mile exclusive of interest and depreciation, but including the wages of the driver and guard. However, some of the cars run over 50,000 miles a year.

Standard Diesels

THE oil-engined railcar and locomotive have long since passed the stage when their performance was such as to render it impracticable to construct a large number of units to one general design. In this matter diesel progress has been more rapid than that of the steam locomotive a hundred years ago, for twenty years after the construction of Stephenson's *Blucher* in 1814 there was nothing like finality in design, or even in details, and there were few instances of more than a handful of engines built to one design. Of course, much of this may be traced to the fact that coincident with the development of the steam locomotive the railway system had to be developed, whereas all diesel vehicles have benefited from a highly perfected railway system. Nevertheless, what may be termed standard units appeared scarcely a decade after the first Swedish car was set to work in 1913. The Ingersoll-Rand 300 b.h.p. oil-electric shunter appeared first in 1924 and in the next ten years over 100 of these locomotives were built. In the same year the first 150 b.h.p. double-bogie Maybach railcar was set to work on the German State Railway, and by the end of 1929 there were 20 of them in service, the last three being fitted out as goods vehicles. This car has since been built with a 175 b.h.p. engine, which retains the air injection of the original 1924 engine. With the trade slump beginning in 1929 the development of oil-engined railcars became much more rapid. The popular 120 b.h.p. Ganz four-wheeled car soon became more or less standardised in Hungary, although some of the type were given six wheels to distribute the load so that they could work over lines of very light construction. The Maybach 410 b.h.p. diesel-electric car in Germany and the 250 b.h.p. Renault car in France have both been built in large numbers since their respective introductions in 1931 and 1932, and the design has spread to other countries with practically no modification. The Fiat Littorina began its life as a petrol-engined car, but all the later vehicles have been powered by oil engines, including the 100 cars ordered by the Italian State Railways last year—the largest order for diesel railcars to one design which has ever been placed. The latest standard car is that evolved by the collaboration of several French firms, and described briefly elsewhere in this issue. It differs from all the other makes mentioned above in that provision is made for the use of three different engine makes, and different forms of control.

THE FRENCH STANDARD RAILCAR

By M. LAMBERT, Manager, Aciéries du Nord



A double-bogie single-engine "standard" car built for the P.L.M. Railway

WHEN at the beginning of 1935 the Northern Railway of France asked M. Dumas, Assistant Chief Mechanical Engineer, to design a railcar that could be ordered in batches by the various railways, there could not then be any question of evolving a formula of a completely general nature for railcar working. The main idea was to produce a vehicle for use on secondary lines, as a single unit, for the transport of passengers and goods. It would need high acceleration to allow high average speeds to be maintained, and be able to haul either a wagon or, at peak periods, a trailer for passenger accommodation.

If a fair number of railcars were ordered with interchangeable driving bogies, there would be spares so that the rolling stock could be kept in good order without putting the cars out of action; a change of driving bogie could be carried out in one night.

Further, the driving bogie should be built in such a manner that different types of engine, such as the Aciéries du Nord, Renault, and C.L.M. types, could be fitted to it; in addition the driving and trailing bogies should be interchangeable. Finally the construction should be robust and well tried to avoid trouble and to facilitate the maintenance. This last-named point is one to which the railways attach the greatest importance.

The Aciéries du Nord were among the first to build a railcar with mechanical transmission in accordance with the P.L.M. programme set up at the end of 1931. After delivering several other types, some with electric, some with mechanical transmission, and having built a diesel engine construction workshop, this firm has produced a railcar with mechanical transmission combining the following important features. A welded steel framework comprising the body framing and underfame (built by the Cie. Industrielle de Matériel de Transport) on the box-chassis principle; semi-streamlined contour, previously tested on a special railcar, and which gives a low air resistance; the high mechanical efficiency of 89 to 94 per cent.; a five-speed gearbox with a free wheel; and a special arrangement for engine and speed control.

These considerations led to the designing of a powerful vehicle, with the full weight available for adhesion. After this vehicle had been tested in service, the Nord, Est, and P.O.-Midi Railways decided in May, 1935 to give the Aciéries du Nord and the Cie. Industrielle de Matériel de Transport the complete handling of these vehicles, to which they decided to give the designation "standard." Forty-one vehicles were ordered, comprising 23 railcars for the Nord, of which five have one driving bogie; eight double driving bogie cars for the Est, and ten vehicles for the P.O.-Midi lines, of which four have one driving bogie.

In order to interest a large number of manufacturers in this idea the orders have been distributed in the following manner:

Construction : Aciéries du Nord.
Diesel Engines : Renault, Aciéries du Nord(M.A.N.), C.L.M—Junkers.
Bogies, Transmissions, Engine Accessories, Assembly and Test : Aciéries du Nord.
Bodies : Cie. Industrielle de Matériel de Transport ; Soc. Nouvelle des Etablissements Decauville, Aîné ; Cie. Française de Matériel de Chemins de Fer (Usines de Tilleul) ; Soc. Industrielle de Bacalan ; Soc. Lorraine, of Lunéville.

The first standard railcar with two driving bogies and powered by Renault engines, has already undergone its tests and is in service at Compiègne. The first standard unit with the two Aciéries du Nord (M.A.N.) engines is now being tested.

The Design of the Car

The standard railcar is 24·4 m. (80 ft.) long and the bogies are pitched at 16·5 m. (54 ft. 2 in.) centres; the wheelbase of each bogie is 3·3 m. (10 ft. 9 in.). The body comprises two driving cabins, a baggage compartment, first and second class passenger accommodation with seating for 29 persons, a lowered entrance platform where 29 passengers may stand, a third class compartment with a seating capacity of 39, a postal compartment, and lavatory accommodation.

There are two power bogies constructed of steel longitudinal and cross members which are either of pressed or welded form. The engine-supporting cradle was designed to take the engine either on three points or rigidly on the raised seats. The pivot is merely for the articulation of the body, which rests on the bogies at points removed as far as possible from the pivot. This arrangement gives excellent suspension. The longitudinal supporting springs of the chassis are arranged parallel to the bogie frames, and are guided vertically by brackets secured to the bogie, the body sliding on the buckles through the intermediary of friction plates. Each bogie

has eight brake cylinders acting on individual shoes, an arrangement which allows for the fitting of brakes of different manufactures. The magnetic brakes are put into or pulled out of action electrically, and without recourse to air.

The various types of power unit adopted are: (*a*) four-stroke 12-cylinder Vee Renault, with a bore and stroke of 140 mm. by 170 mm., developing 265 b.h.p. at 1,500 r.p.m., and with a continuous rating of 240 b.h.p. at 1,425 r.p.m. (*b*) Aciéries du Nord (M.A.N.) four-stroke six-cylinder engine with precombustion chambers, the bore and stroke being 195 mm. by 220 mm. The continuous power output is 210 b.h.p. at 1,100 r.p.m. (*c*) C.L.M.-Junkers 250 b.h.p. two-stroke engine, with four sets of cylinders and opposed pistons, the cylinders having a bore of 120 mm. and a stroke of 150 mm., or 300 mm. combined stroke, and running at 1,500 r.p.m.

The control lever on the driving dashboard comprises a low-pressure cylinder which is standard for all three types of engine, but, while in the Renault and C.L.M.-Junkers engines this low-pressure cylinder governs the fuel injection, on the Aciéries du Nord (M.A.N.) engines this particular cylinder controls the revolutions and a special regulator admits the fuel, in such a manner that speed is maintained no matter what the load. This special fixture greatly facilitates the driver's task.

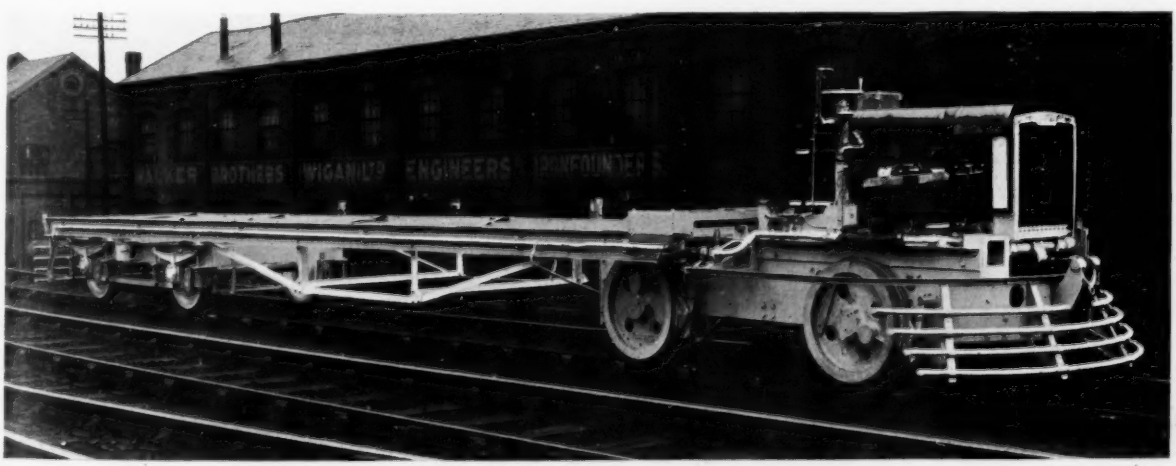
S.L.M.-Winterthur oil-operated mechanical transmission is used, certain parts being built in Switzerland and others at the Aciéries du Nord works. The engine is coupled to the primary gear shaft by means of one torsional and two flexible couplings. The gearbox actually consists of five steps whose distribution has been very carefully studied. The ratios are 4·15, 2·22, 1·54, 1·25, and 1·0 to 1. Each wheel of the secondary shaft is fitted with a double disc clutch, the working of which is assured by a supply of oil provided by a distributor. This arrangement allows a dead period of less than one second, besides giving great ease in driving, and being easily adaptable to remote control and the coupling of two transmissions. After the secondary shaft comes a free wheel, a reverser, and cardan shafts driving two bevel wheels on each axle.

True to the principle of standardisation, these transmissions are identical no matter what engine type is used, and the different rotational speeds of the engines are catered for by different reversing gear ratios. The maximum speed contemplated for these standard cars is 120 km.p.h. (75 m.p.h.). This speed is attainable on level track with a trailer, or on a 1 in 125 gradient when running alone From starting up on the level, a speed of 80 km.p.h. (50 m.p.h.) can be attained in 72 sec. Both these performances can be attained with a vehicle loaded up to 8 tonnes.

British-Built South American Railcar

The Peruvian Corporation Limited ordered sixteen weeks ago from Walker Bros. (Wigan) Ltd. a double-bogie standard gauge railcar. This vehicle has been completed and will shortly be shipped to South America. The design incorporates the Walker power bogie with the passenger portion of the body articulated to it, as adopted by several Irish railways. Power is provided by a Gardner 6LW engine developing 102 b.h.p. at 1,700 r.p.m. and its torque is transmitted to the inner axle of the power bogie through a friction clutch, Meadows four-speed gearbox, and a final worm drive. The wheels of the power bogie are not coupled, but provision has been made for doing this with ease if it should be required in future. Both the driving and carrying bogies are fitted with Timken roller bearings.

Braking is on the vacuum and hand systems, with a separate vacuum cylinder for each bogie; hand brakes are fitted only to the power bogie. The steel underframe of the car is of light but rigid construction and carries a body seating 61 passengers. The panel and roof plates are of aluminium. The car tares 15·8 tons, or 580 lb. and 1·7 b.h.p. per seat, and with a full complement of passengers weighs 19·1 tons. On the gross figure the b.h.p. per ton is thus 5·35. Although the maximum normal speed is 50 m.p.h., the car attained a top speed of 55 m.p.h. during trials last Sunday between Wigan and Birscough Junction on the L.M.S.R., and covered nine consecutive miles at an average of 49 m.p.h. The guaranteed figure of 50 m.p.h. on the level was exceeded.



Power unit and chassis of 100 *b.h.p. Walker railcar for the Peruvian Corporation*

THE ORGANISATION OF DIESEL RAILCAR ENGINE OVERHAUL, BELGIAN NATIONAL RAILWAYS

*By ED. VANDERPUTTE**

RUNNING repairs to the railcar equipment of the Belgian National Railways are carried out by the staff of the depot at which the cars are stationed. For overhauls recourse was at first had to the builders, but this was expensive and involved valuable rolling-stock being out of action for a considerable time. It was therefore sometimes more expedient to carry out certain repairs of an unusual nature on the spot. This gave rise to many difficulties and it became apparent that a repair shop must be provided where the periodic overhauls could be centralised. This arrangement attained the main objects of reducing periodic out-of-action times and costs of inspection; reducing tool costs (one set of tools was, in fact, found to suffice); standardisation of upkeep and repair methods; centralisation and reduction of spare parts, giving an appreciable reduction in total expenditure; and the better use of an expert staff on account of properly distributed work and widening experience. The repair shop under review was installed at the Louvain locomotive shops on a site measuring approximately 102 ft. by 39 ft., and it was provided with a 5-ton overhead crane controlled from ground level.

Before passing to a description of this workshop and its purpose, it is well to recall that the 175 b.h.p. Maybach engines which constitute the majority of units in service have their six cylinders and the heads cast in one piece. The main bearings and the connecting rod big ends are fitted with roller bearings. The three-stage compressor, to produce the injection air, is directly controlled by a fluid gear to the engine shaft. The compressed air produced by the compressor is also used for starting the engine.

All the other types of engines have mechanical injection and are electrically started by a motor in conjunction with the battery. The 410 and 210 b.h.p. Maybach engines are or can be used for pneumatic starting during valve grinding on the test bench. The 410 b.h.p. engine is of the 12-cylinder Vee type and has mechanical injection.

Method of Inspection

From the workshop point of view the examination routine of an engine is as follows: (1) dismounting, (2) cleaning, (3) inspection, (4) repair of detachable portions, (5) reassembly, and (6) running in on test bench.

Having regard to the floor space available, the original workshop, see Fig. 1, was arranged according to the order in which these operations are carried out. The engine, well protected by a supporting box open at the top, arrives on a trolley at the spot marked (G) on the attached floor plan. It is then taken to (L) for dismounting. As oil is liable to trickle out during this performance, the floor is made of oil-proof, easily washed, non-slip paving stones. Concrete is no good for this purpose. The dismembered parts are placed on shelved benches (M) which are fixed, or on shelved trolleys, to await their journey to the cleaning section (N). The amount of floor space set aside for this operation was soon found to be insufficient and it was necessary to extend it. The cleaned parts are next inspected at (I) for cracks, after which measuring and checking up of the surface condition are done at (K). The shelved benches (M) receive the repaired and cleaned parts of the engine and compressor which

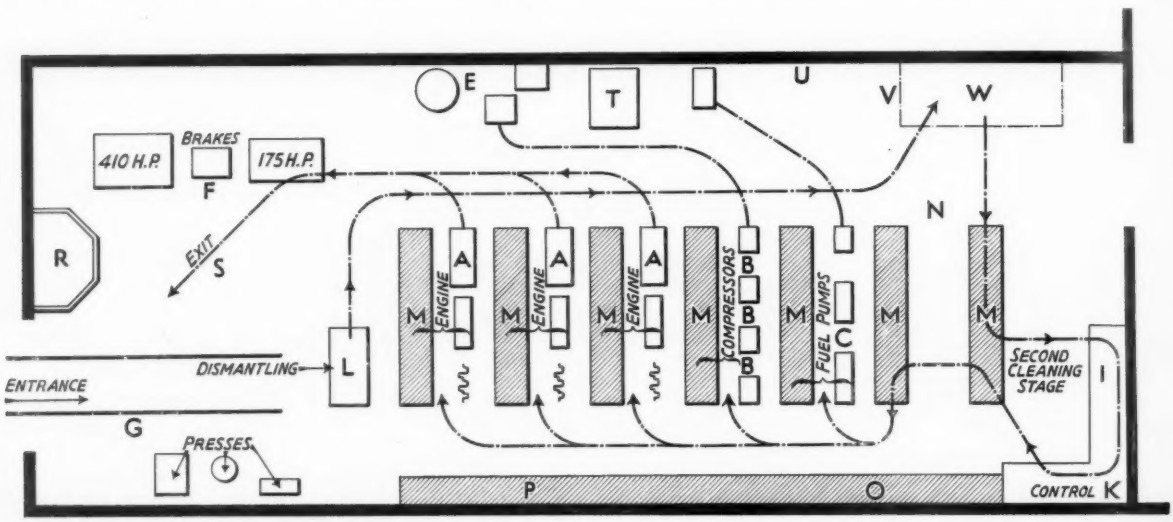


Fig. 1—Floor plan of the original oil engine repair shop at Louvain

A—Placing of engines for repair
B—Compressors for repair
C—Fuel pumps
E—Compressor test-bed
F—Engine test-bed
I—Second cleaning stage
K—Control stage
L—Location of engines for stripping
M—Shelved tables
P—Fitters' benches
R—Sound-proof cabin
T—Test-bed for gearboxes
U—Test-bed for fuel pumps
V—Finishing lathe
W—Cleaning plant

* This article appeared originally in the pages of *L'Allégement dans les Transports*, and we are indebted to Mr. A. M. Hug, the editor of that journal, for permission to publish a translation of it.

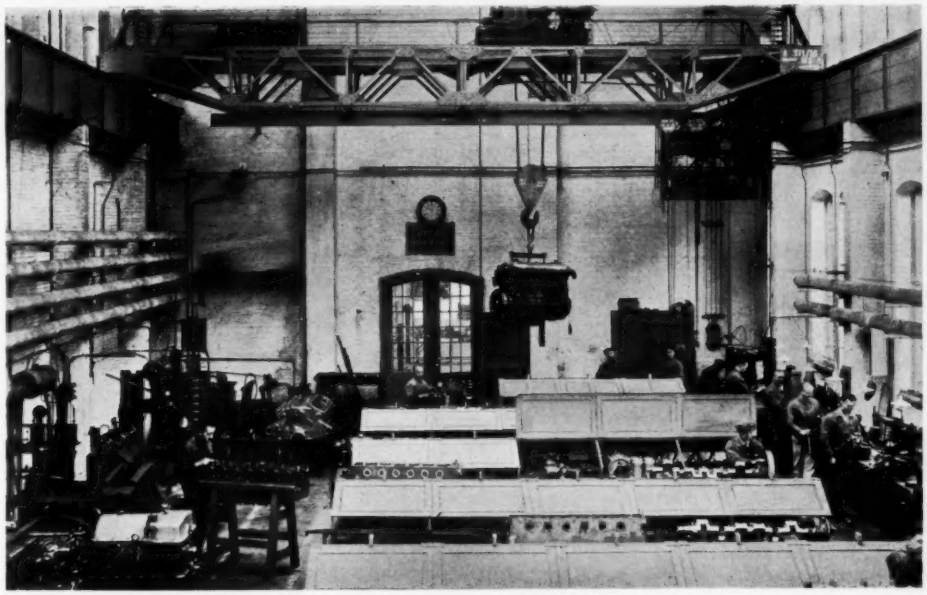


Fig. 2—General view of the original shop set aside for repairs to railcar diesel engines at Louvain works. The engine suspended from the crane is one of the 175 b.h.p. Maybach units

are grouped in a specific way before reassembly. Transport between the mounting section and these benches is by means of shelved wagons.

At (O) the fuel pumps are inspected and at (P) the compressor pumps receive attention. Between the benches (M) are placed trestles specially intended for the assembling and general revision of the engines and their principal constituents. The reassembly finished, the complete engine passes to the testing bench (F), which consists of two foundation units with a hydraulic brake between. On these foundations are placed metal cradles suitable for holding each type of engine. At (R) is a soundproof cabin to enable the staff conducting the tests to converse and to receive telephone messages without being disturbed by the deafening noise of an engine on test. Actually it is preferable to have a solid partition between the testing benches and the workshop.

Section (S) is reserved for the packing of engines before sending them away, and for the dismounting and reassembly of gearboxes. These last-named operations require the use of hydraulic presses installed at (P) an used for the pressing off and on of certain pieces. Along the wall, in a line with the testing bench, are installed at (T) a test bench for gearboxes and compressors; at (U) a testing bench for fuel pumps; at (V) a small finishing lathe; and at (W) a combined grease-remover and distiller of used cleaning liquid, so that this can be used again. The installation briefly described above has been successful, considered as a first attempt, but as the number of diesel engines in service, and consequently their overhauls, increased, so the need for enlargement grew. Accordingly a new and larger workshop is being completed. It is shown in Fig. 3 and 4, and comprises (*a*) Department A for overhauls, and (*b*) Department B, at right angles to Department A. The new installations include a cleaning equipment, a dismantling department, and three rows of benches and tools, running the length of the workshop and each served by a monorail crane. Benches for special jobs (repair of pumps, injection parts, &c.), an equipment

Fig. 3—General view of the extension of the diesel engine repair department at Louvain (Section B in Fig. 4). Each of the vertical columns has connections for the supply of compressed air, gas, and 35-volt and 6-volt lighting circuits

for the repair of gearboxes, and a group of machine tools are also included, together with two testing benches (G), the second one being necessary so that two engines can be run in at the same time.

The unloading of engines from the wagons to the workshop trolleys will be done by means of an electric crane straddling the entrance track. The lifting of heavy portions of dismantled engines is carried out by means of wall cranes *a*, *b*, and *c*. The use of an overhead crane was abandoned in view of the fact that although such a crane can cover the whole surface of the shop, it can serve only one section at a time. Also, during the course of adjustment of a crankshaft and during various phases of dismounting, the frequent use of a lifting machine and some means of suspension is indispensable to several groups of workers at one and the same time. For this reason the travelling crane is being replaced by the three monorail models, fitted with several pulleys each.

Repair Operations

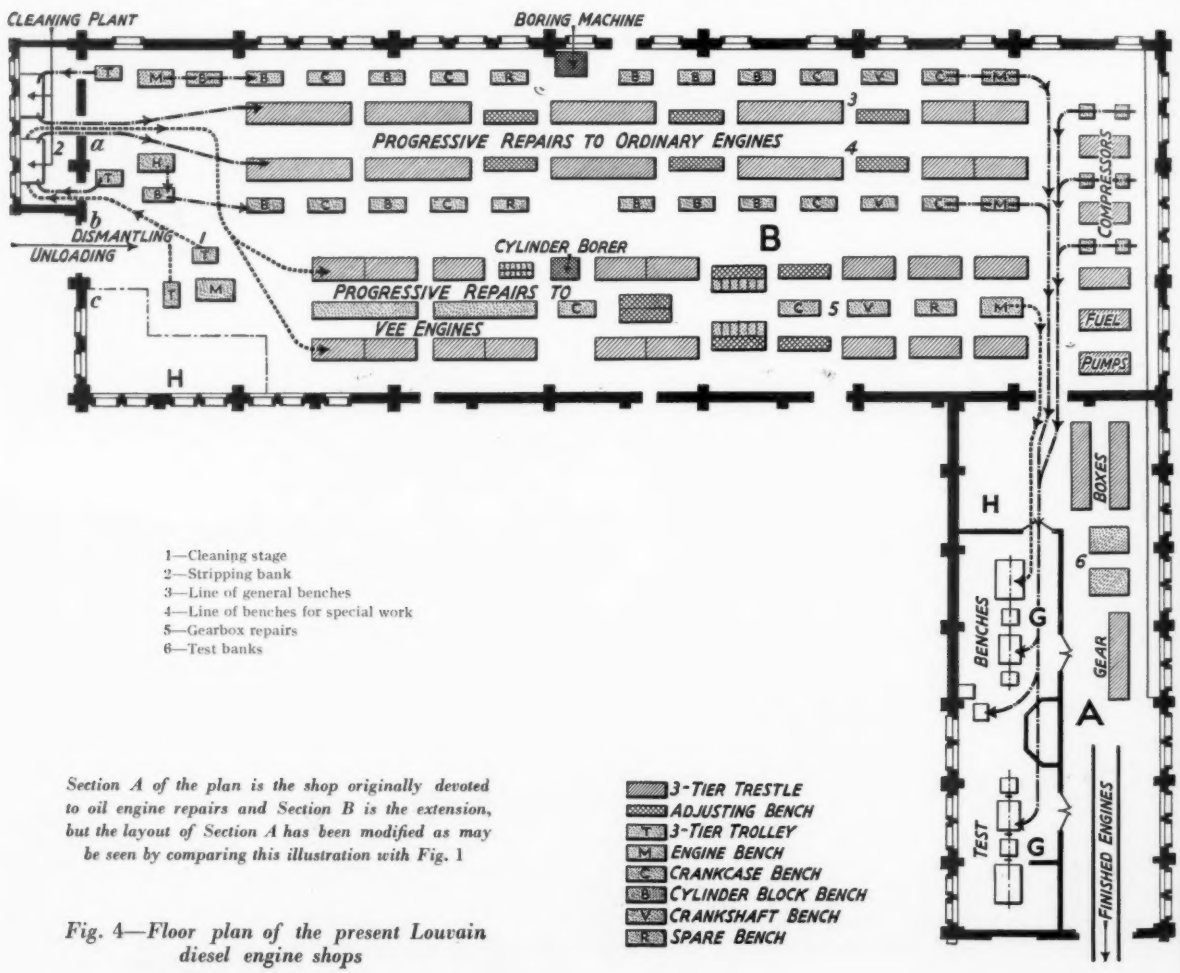
The technique adopted is based largely on that of the Maybach Motorenbau, which allowed the Belgian National Railways to profit by its own experience in this domain. The methods could easily be applied to other forms of engine.

The engine parts, after having been carefully dismounted and sorted out on the shelved wagons, are thoroughly cleaned by hand. As they must not be exposed to rust, the use of steam and alkaline solutions is taboo. Liquid chlorides are generally used, such as tri-chloride or per-chloride of ethyl, made by Wacker of Munich, or the di-chloride of ethane (ASOL) of the Union Chimique of Zandvoorde, Ostend. (Price 5·50 and 4·50 Belgian fr. per kg. respectively.) These products, being non-inflammable, give a great element of safety, but their fumes are of an intoxicating nature and the personnel has to be protected against them by means of adequate ventilation.

Cleaning necessitates a good deal of manual labour; with the aid of hard pincers, metal brushes, metal-impregnated pads and scrapers of pasteboard and wood. The workman removes the last traces of congealed grease, then wipes and dries with great care all the surfaces. For certain of the parts a bath in benzine (white spirit) or petrol is advisable. The soiled chloric solutions are to a great extent reusable after distillation. The cleaned parts are moved to a sorting table near the inspection section. The actual cleaning is performed in galvanised iron tanks sufficiently large to take the crankcase of the biggest engine in service. These tanks are fitted with wooden screens suspended in them. The tank sides are coated with red copper or wood so as to avoid damaging the parts. Fumes are led off through a pipe situated midway down the tank. This pipe is linked up to a powerful funnel ventilator. The small engine parts to be dipped in benzine are done in smaller tanks, which are kept covered to avoid loss by evaporation.

Inspection of Engine Parts

This part of the overhaul includes a systematic research for cracks, the checking up of dimensions to weed out those parts unfit for further use, and a search for surface faults.



Section A of the plan is the shop originally devoted to oil engine repairs and Section B is the extension, but the layout of Section A has been modified as may be seen by comparing this illustration with Fig. 1

Fig. 4—Floor plan of the present Louvain diesel engine shops

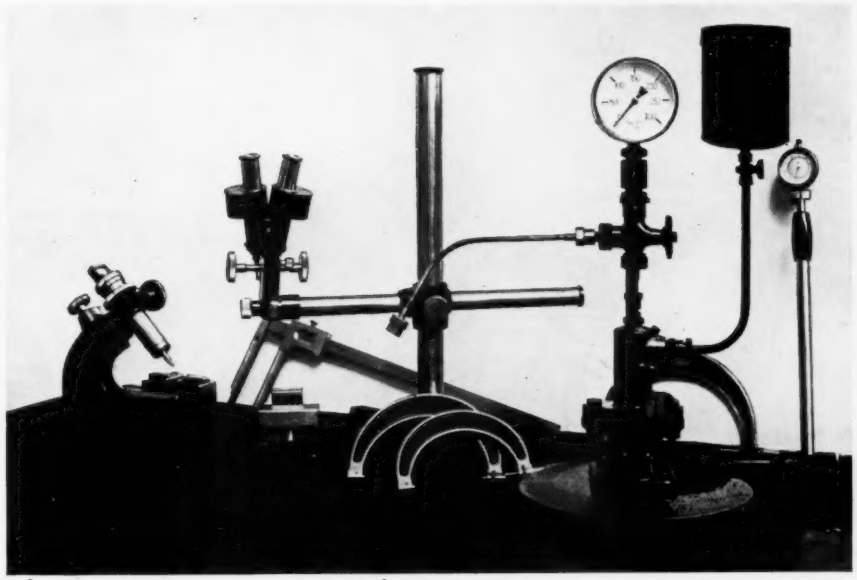


Fig. 5—Instruments used for the inspection and checking of oil engine constituents. From left to right are a Hirth minimetre; binoculars for the examination of the roller bearings and cages; a vernier with a range of 0·1 to 500 mm.; two outside micrometers with a combined range of 25 to 300 mm.; a Bosch test pump for injection nozzles; and an inside micrometer for measuring internal diameters up to 200 mm.

The hunt for fissures is effected by plunging the cleaned parts into a bath of methylated spirits to which is added 50 gr. 0/00 of finely pulverised chalk. This solution is for parts made of cast iron; for other parts 65 gr. 0/00 is added. The larger parts are submerged by grapplers. Where there is no danger of oxidation, ordinary drying off is allowed to take place, but where polished steel is concerned the drying process is hastened by heating by means of a gas blow-pipe worked by air. When fissures contain oil this element appears on the surface and indicates the fault by a black line on the white chalk deposit. Afterwards a second clean-up is carried out to remove the last traces of chalk.

Checking up the Dimensions

This operation requires very precise instruments, viz., a Hirth minimetre graduated to 1/500 mm. and capable of measuring 1/1,000 mm. on the bearing rollers so that those of the same size can be assembled in the same bearing; a binocular microscope with a magnifying power of 25 to 30, for the examination of the rollers and cages; a vernier capable of measuring from 1/10 to 500 mm. and with a jaw depth of 200 mm.; two micrometers with a working range of 25 to 300 mm.; a Bosch testing pump for checking the fuel delivery; a series of inside micrometers permitting the measurement of interior diameters up to 200 mm. with an accuracy of 1/100 mm. These instruments are used chiefly to check over the rollers from the main and big-end bearings of the Maybach engines.

When searching for surface faults a binocular magnifying glass is needed with a magnifying power of 25 to 30. This instrument, mounted on an adjustable base, is used to inspect the surfaces of the rollers and cages of the main and big-end bearings, to disclose pitting holes not visible to the naked eye. All these instruments are neatly arranged in lockable cupboards, placed near a sorting table covered with linoleum, for the easy upkeep and preservation of the instruments. Among other accessories are a gramme scale balance for weighing connecting rods and pistons; a small electric transformer for electro-graving

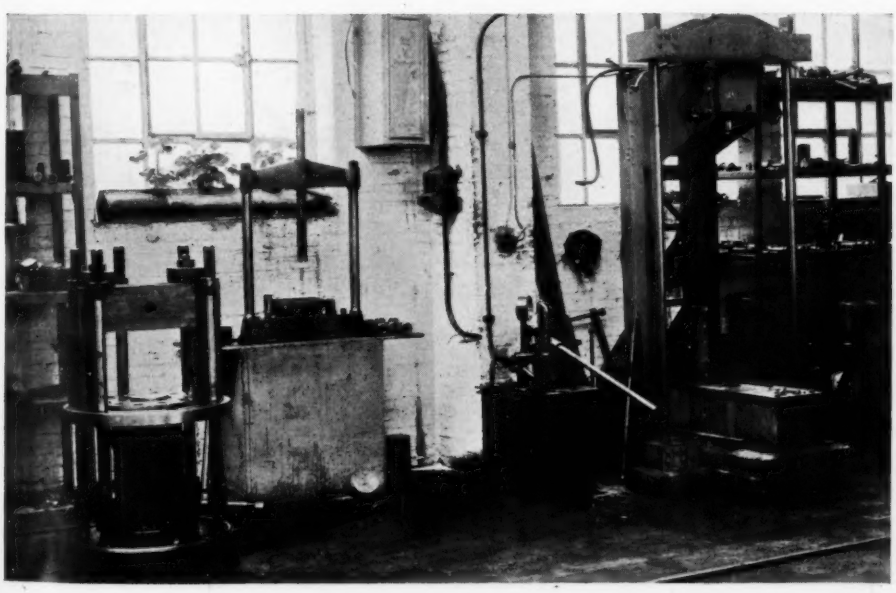


Fig. 6—The hydraulic presses used in the railcar diesel engine repair shops at Louvain. They comprise, to the left, a 225-ton press for the gear wheels of the transmission; to the right, a 90-ton press for cylinder liners; and in the centre a double-cylinder hand pump, giving a hydraulic pressure of 1,300 lb.

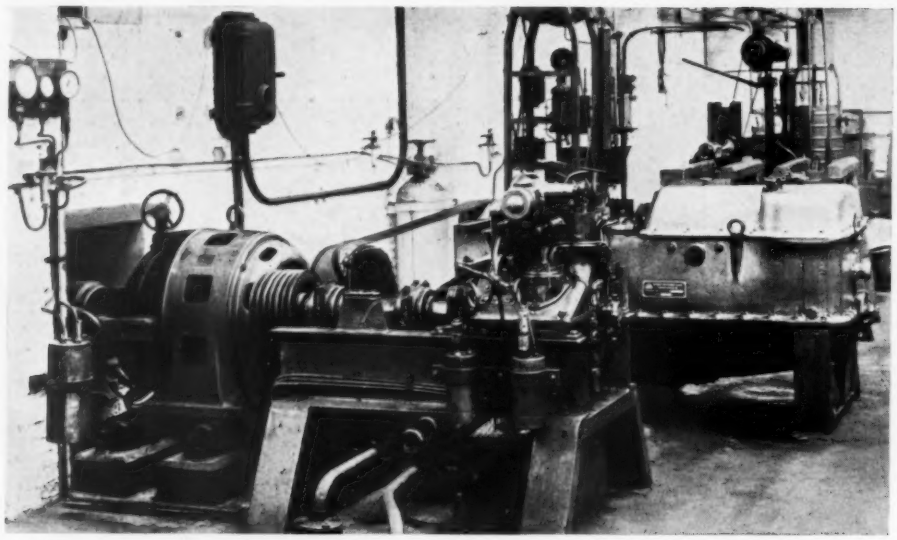


Fig. 7—View of one of the test beds at Louvain shops for the testing of the compressors and gearboxes used in conjunction with the Maybach oil engines. To the right is an Asea three-phase electric motor used for the belt drive

marks and numbers on dipped pieces; and a powerful lamp to throw a concentrated light on parts under the microscope.

Apart from these operations, the overhaul of the engines includes a host of others, among them the dismounting and remounting of gearbox shafts, connecting pipes, and compressor angles, which require hydraulic presses. The workshop at Louvain has two such hydraulic presses, one with clamps placed concentrically, with a drop of 0·50 to 2 m., according to the length of the clamps used, and which is used for piston diameters of 190 mm. and 225 tons maximum pressure. A second model, of the swan-neck type, has 1·50 m. drop for 100 m. diameter of piston and 92 tons maximum pressure.

The pumps which work these presses are of the hand-operated type of heat test, but with double pistons, oil-fuelled and capable of attaining pressures of 800 kg/cm². Everything needed for these presses is laid ready on metal stages placed near at hand. The hand pumps, of the same type as that used on the presses, are used to test the watertightness of cylinder casings and other details.

After the compressors have been repaired, they are first run in and then tested for their output. To this end is used a 35 b.h.p. reciprocating variable-speed engine driven by a V-belt to a shaft mounted in a metal cradle. On this cradle is bolted the compressor which is directly coupled to the motor-driven shaft. Compressors can thus be run in at gradually increasing speeds. The electric motor is arranged to work also another test bench used for verifying the working conditions of gearboxes.

For the Maybach engines with air injection, the verification of the fuel quantities delivered under pressure by the injection air requires a control bank. An electric motor drives, by means of gears, the oil pump to be checked. The six outlets of these feed an equal number of small calibrated cylinders fitted with pistons, whose rods pass through a packing gland. The compressed air exercises a counter-pressure on the outside surface of the piston, and the outside end of the piston stem comes up against an index marked out in millimetres. The six outlets must be identical. Safety valves limit the pressure attained to 100 kg. per mm².

For the Bosch pumps used on the mechanical injection engines, the verification equipment consists of a pump (with one cylinder) fitted with all necessary accessories (*e.g.*, the manometer and lever), to verify the point and time of injection, the shape and direction of the pulverised jet, and also the injection pressure obtained. The repair of pumps needs a few hand precision tools (borers, filters, spindles, calipers). The Bosch pumps often require the help of the builders, especially in regard to injection nozzles, but all these operations are carried out in the Louvain workshops.

The vices used must be of the parallel type, with large guiders and jaws arranged in such a relation to the longi-

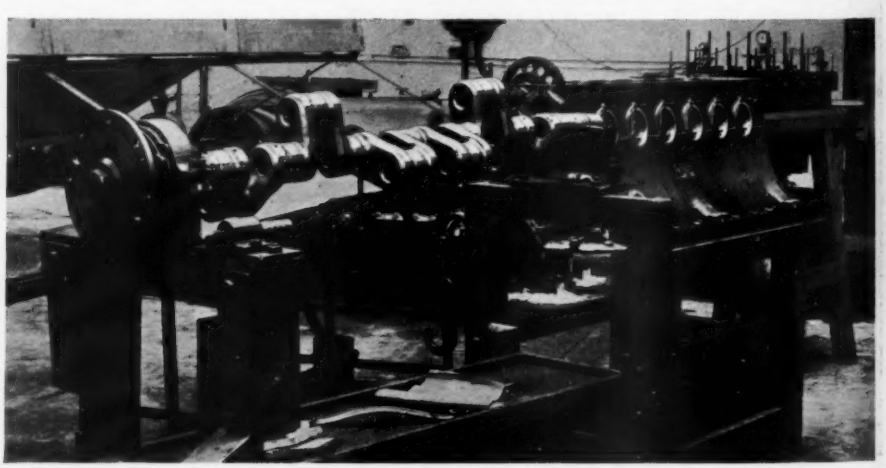


Fig. 8—Trestle for the inspection of the crankshafts of the Maybach engines after cleaning. In the background is an integral crankcase and cylinder block from one of the 175 b.h.p. engines

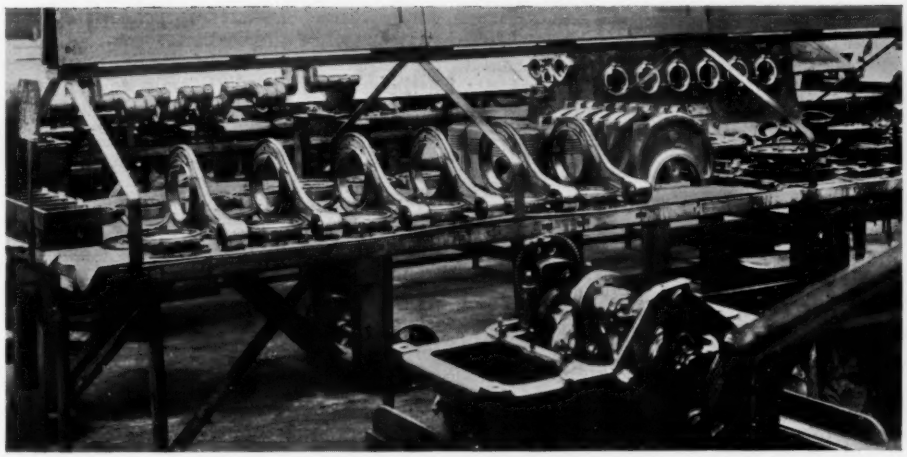


Fig. 9—The trestle table used for the reassembly of the roller bearing connecting rods of the Maybach oil engines. In the foreground is part of a dismantled compressor

tudinal axis as to allow the gripping of certain shafts in a vertical plane. As they are repaired or replaced all the parts of one engine or portion of engine are set out in methodical order on the sorting tables. These have a metal framework of light angle construction, or sometimes of old tubes. Taking into consideration the large space needed for the sorting of numerous pieces, experience gained has led the Louvain workshop to create a type of table with three shelves. A shelf near the floor is for fair sized parts. Midway up is another shelf, divided into two lengthwise, and made up of panelling with U-shaped iron rollers. The top shelf is covered by light panels of three-ply wood with firwood frames, fitted with hinges. These panels, supported by bent flat iron bands, form the sloping covers of a kind of double desk. The object of this arrangement is two-fold : to hinder the fall of dust on to the engine parts, and to give the workshop generally a tidy aspect. Oil paper is very largely used to cover the mountings. Between the classifying shelves are fixed special trestles for each kind of process to be effected. Thus the trestle for the crankshafts is arranged for the easy revolving of the assembly and is sufficiently solid to stand up to jerks and reversing movements during action. Apart from the ordinary lighting, large use is made of portable means of lighting when examining the crankshafts.

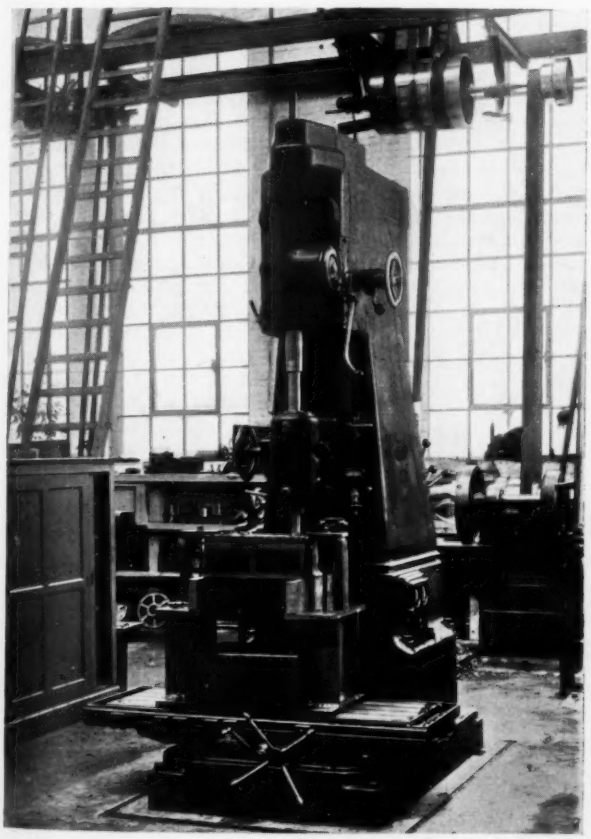


Fig. 10—Krause precision cylinder boring machine. It has a speed range of 250 to 2,500 r.p.m. and a feed of 0·01 to 0·24 mm. per revolution

The portable electric lamps have a tension of 35 volts, this being the maximum permitted by official regulations. For the internal inspection of such parts as cylinders and tubes, tiny 6-volt lamps are used, and are mounted on a slender bent copper tube. For this voltage, transformers are placed around the workshops at suitable points, and this low-voltage arrangement is necessary because of the very small lamps. It is also most necessary to have compressed air for the cleaning of various parts and gas-pipes for heating operations. For general machine work the diesel engine department depends upon Louvain locomotive works.

Although most of the renewed parts must be purchased from the constructors of the engines under consideration, it was found necessary to make some of them on the spot or to have recourse to local industry, to lessen first cost of such parts. Apart from this general equipment, mentioned above, it was found advisable to order the following special tools :—

(1) A vertical boring machine of the Krause type for boring cylinders and facing the cylinder castings. Experience gained has proved that by means of this machine very satisfactory work can be turned out, and honing and burnishing machines as used in other shops can be dispensed with. The Widia knife used on the Krause machine must be sharpened on a special grinding machine supplied with diamond powder. Without this special accessory the finish obtained is not sufficient.

(2) Machine to align the main bearings. The types of engine used need very delicate handling for the adjustment of the seven bearings supporting the shaft. It is almost impossible to align these manually. In spite of using specially trained workmen, this operation remains precarious. It is really better to use a mechanical adjuster on a special tower.

(3) The engine bearings are subject to seizing at the

crank webs. The scraping of these radii is a very delicate operation, and very hard to carry out sufficiently exactly by hand. For this reason special machines are used for crankshafts ; these are used in two ways, with the crankshaft moving in the longitudinal plane and with the carriers fixed, or with the crankshaft fixed and the carriers movable in the longitudinal direction. In both cases adjustable balancing is a necessity. These machines are very expensive. They are not justified unless a great number of repairs are expected, otherwise their first cost adds greatly to the repair costs of the engines. Another point : as the maximum dimensions of engines shortly to be made are not yet determined, it is difficult to choose a machine for future use.

(4) Engines with separate liners often give rise to water leakage between the liner and the cylinder. These leakages result in the deformation of surfaces in contact. This can be remedied by grinding both liners and cylinder on a perfectly flat rotating table, and with a carborundum paste between. The Louvain shops have therefore made a combined machine by using a circular machine-tool table on a shaping machine. This table revolves slowly. The engine part follows the motion of the shaper carrier, and this movement is altered by a combination of circular guides attached on a vertical axis.

(5) A machine for adjusting and balancing is necessary.

All repairs must be finished off by a more or less lengthy time spent on the test bench. This test is for running in, inspecting for small imperfections, checking up the power output, the adjustment of such details as the fuel pump and regulator, checking the fuel consumption and the circulating water temperature, and so on.

As already mentioned, Louvain works have at the moment one test bench, but for future organisation an extra bench has been installed, and includes a Junkers hydraulic reversible brake. Two foundation blocks are placed on the axis of this brake to right and left, and each is composed on the upper surface of a concrete block to which are fixed four longitudinal I beams placed parallel to one another, and the higher portions of which jut out about 50 mm. (2 in.). The foundations are separated from the surrounding floor by 50 cm. (20 in.) of rolled gravel, which has been introduced to take up vibrations. For running in each type of engine a special cradle is provided. These cradles can be mounted on the foundations and fastened in position by special bolts in the beams set in the concrete.

The hydraulic brake being reversible and having two coupling ends to the main shaft permits of a second engine being mounted during the running in of the first without postulating the rotational direction. The Junkers brakes are of two types, 675 b.h.p. in the region of 1,500 r.p.m. and 1,200 b.h.p. at 1,410 r.p.m. Their working requires for a quantity of 11·5 litres of water per b.h.p.-hr. the raising of the temperature by 10° to 65° C. With a difference in temperature of 63° C., 10 litres of water are required. The hydraulic installation comprises a sufficient reserve of water to prevent the temperature limits being surpassed at the end of several hours' work. The installation includes a gauge to show the fuel consumption, tachometers, thermometers, and so on.

When planning a new workshop, where no existing local conditions have to be considered, it is a good idea to provide for the complete isolation of the cleaning department, on account of the nature of the work, and also of the grinding department, because of the noise from the general workshop. In the grinding section a soundproof cabin should be provided. That at Louvain has three walls. Between two of these is a layer of granulated cork ; between second and third are layers of glass wool. The exterior and intermediate partitions are constructed of plywood and the inner in beaver board. Both floor and ceiling are treated in like manner. The windows are made up of three sheets of glass with an air space between. The door is sealed by strips of felt. This cabin shuts out the noise sufficiently to enable a telephonic conversation to be carried on.

Apart from the ordinary inspection duties of making good any running defects, the Louvain shops have given great attention to the systematic investigation of causes of failures, and the possibility of prolonging the working life of certain parts. In this connection may be mentioned the fitting of liners to the cylinders ; these, in the 175 b.h.p. Maybach engines, have a normal bore of 140 mm., with a limit of 142 mm., which is attained at the end of two or three reborings. The cylinder casting costs about 23,000 Belgian francs (£160), and it was thought as well to attempt to reclaim cylinders which were normally considered at the end of their tether. This has been done by making the liners in a centrifugally cast iron 3 mm. thick, as indicated in Fig. 12. It has been very successful, as

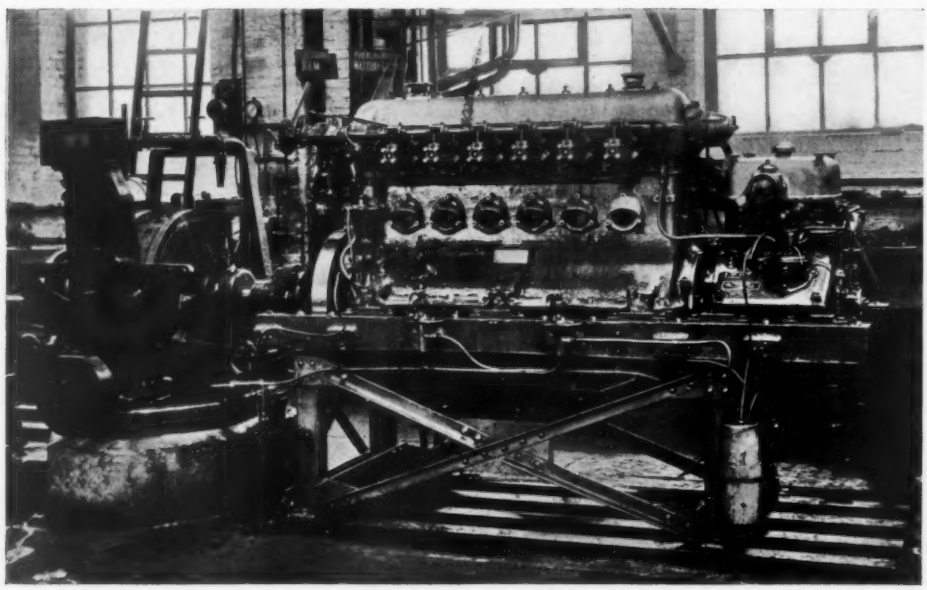


Fig. 11—A Maybach 175 b.h.p. oil engine on the test bed at Louvain works. The compressor used for the injection and for supplying the gear-changing air is attached to the engine at the right-hand end. To the left is the Junkers hydraulic brake

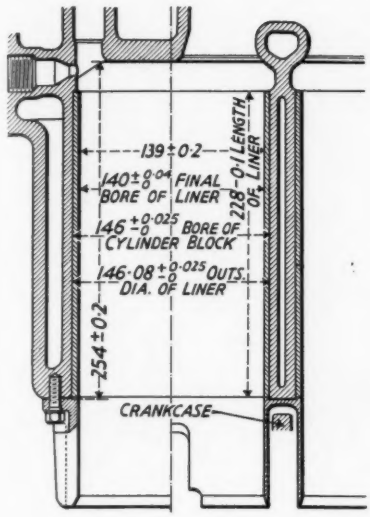

139 ± 0·2
140 +0·04 −0 FINAL BORE OF LINER
146 +0·025 −0 BORE OF CYLINDER BLOCK
146·08 +0·025 −0 OUTS. DIA. OF LINER
254 ± 0·2
228 - 0·1 LENGTH OF LINER
CRANKCASE

Fig. 12—Section through cylinder of Maybach engine after reboring and the fitting of a liner at Louvain shops

witnessed by the fact that the cost of the liners amounts to only 13 per cent. of the initial cost of a cylinder casting. It has thus been possible to re-use cylinder blocks which were badly pitted, and would otherwise have been discarded.

Publications Received

Gardner Engines.—We have received a copy of the catalogue pertaining to the Gardner L3 types of high speed oil engine made by Norris, Henty & Gardners Limited. These engines are made in four sizes with outputs on intermittent duties of 102, 127, 153, and 204 b.h.p. respectively at 1,200 r.p.m., the number of cylinders being four, five, six and eight. This type of Gardner engine is used a good deal in traction work, the latest example being the 6L3 engine of 153 b.h.p. installed in the Great Northern Railway of Ireland articulated train, which is described elsewhere in this issue. Gardner engines are used in other Irish cars, in the numerous Drewry locomotives for Mexico, and for various services in Australia, Africa, Argentina, and Belgium.

Les Moteurs à Huile Lourde. Supplement to the *Bulletin Technique du Veritas*. Paris: 31, Rue Henri-Rochefort. 86 pp. Price: 20 fr. net.—This publication is a special supplement to the April issue of the Veritas bulletin, and discusses (in French) the heavy-oil engine for marine and general purposes. There are short sections dealing with diesel railcars and diesel locomotives, both very limited in the applications considered, but the most interesting section of the whole publication, on the status of the oil engine for transport, keeps to road applications, and does not cover the railcar field except in the examples where certain lorry engines are used without modification in railcars. Another interesting chapter deals with the application of heavy-oil engines to aviation, and short notices are also given on fuels for diesel engines, and supercharging.

Elements of Diesel Engineering. By Orville Adams. London: Constable & Co. Ltd., 10/12, Orange Street, W.C.2. 9¾ in. by 6¼ in. by 1 in. 478 pp. Illustrated. Price 18s. 0d. net.—Although not a book on design, this volume might be found handy by many a designer for purposes of reference, for it contains a host of clearly reproduced drawings of details and general arrangements covering a wide range of practice. It is a book which does not belie its title, and it is essentially suited to the man who actually is dealing with diesel engines and not to those who merely wish to improve their general engineering knowledge. If there is a fault in the text it is that the author has tried to get too much between one set of covers; not that the quality of his information has suffered, but rather because the variety of it is so bewildering. This effect is heightened by the inclusion of one or two pages of questions and answers after each of the 20 chapters. Much interesting information is given on fuel injection, turbulence, combustion, and piston rings, and also on the maintenance of the type of high speed engine used in road work, but the author is scarcely fair to the merits and possibilities of supercharging. Railway oil engines are mentioned only here and there; nevertheless, no responsible railway officer with a number of oil-engined vehicles under his care could fail to profit by reading this book. The value of the work would not suffer if chapter V, on the spark ignition engine, were cut out. And it would be enhanced if chapter XIII was omitted. Dealing with high speed diesel development in Europe, this chapter is badly out of date, and is curious in being illustrated largely by American engines. Although the quality of most of the illustrations leaves little to be desired, their arrangement might have been improved, and it is sometimes necessary to turn as many as 14 pages before one comes to the illustration referred to in the text. And, of course, a number of the illustrations are those which seem to be common to over half the books on the diesel engine.

SAURER ENGINES.—There are now 252 Saurer oil engines at work in, or under construction for, rail traction. They vary in power from 90 to 300 b.h.p., and all except 18 are installed in railcars. The remainder are used in locomotives.

MORE RAILCARS IN SPAIN.—The M.Z.A. Railway has taken delivery of the first two of the four broad-gauge Renault railcars of 265 b.h.p., the order for which was noted in the issue of this Supplement for November 29. These cars seat 81 passengers on a tare weight of 31 tonnes.

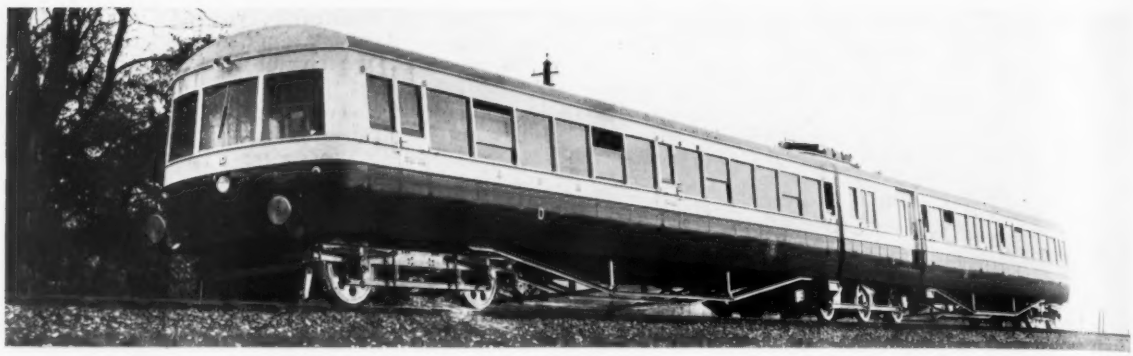
EGYPTIAN RAILCARS.—It is reported that the 20 Ganz diesel railcars for the Egyptian State Railways, the order for which we were able to announce exclusively in the May 15 issue of this Supplement, may be grouped as ten articulated two-car sets.

ANOTHER IRISH ORDER.—The County Donegal Railways have ordered a 40-seater 96 b.h.p. diesel-mechanical railcar. As before, the power equipment and bogie will be built by Walker Bros. (Wigan) Ltd., and the mechanical portion and car body will be built in the Dundalk shops of the Great Northern Railway of Ireland.

FRENCH RAILCAR PROPOSALS.—The 1936 Budget of the French State Railways provides for the acquisition of 30 railcars of 300 b.h.p., for service on the Paris–Cherbourg, Paris–Dieppe, and Saint Brieuc–Brest lines. Allowance has been made also for the construction of 10 cars of 500 b.h.p. for the operation of fast trains between Nantes and Bordeaux, Nantes and Rennes, and Nantes and Saint Brieuc. The P.L.M. budget contains an allowance for 30 diesel cars, each powered with a 300 b.h.p. engine. It is intended to station these cars at Clermont-Ferrand, from which centre they will work to Laroche and Grenoble. The P.O.–Midi budget contains an allowance for the construction of 20 cars of 250 b.h.p. which will be used for fast cross-country services.

ARTICULATED TRAINS FOR IRISH SUBURBAN SERVICE

Triple set taring 39½ tons seats 159 passengers in three classes



One of the new 150 b.h.p. articulated diesel-mechanical trains for the 5 ft. 3 in. gauge lines of the Great Northern Railway of Ireland

AS we briefly recorded in the May 15 issue of this Supplement, the Great Northern Railway of Ireland has just put into service two articulated diesel-mechanical trains. Intended first for the Belfast-Lisburn suburban service, with certain trips out to Antrim, one of these sets has been allocated to the Dublin-Howth suburban line. As with three of the five previous cars of the G.N.R. (I.), the carriage bodies and underframes and the carrying bogies were built at the company's Dundalk shops, while the power bogie and transmission were supplied complete by Walker Bros. (Wigan) Limited to the specifications and designs of Mr. Geo. B. Howden, the railway company's Chief Engineer.

In this case it is not quite correct to say " power bogie," for all the motive power equipment is mounted on a six-wheeled rigid frame unit, to which the two passenger carriages are articulated, as indicated on the accompanying drawing. The carriage bodies are of timber construction with outer panel sheets of steel finished externally in blue and cream; the roof is of wood covered with canvas and painted grey. The interiors are finished in veneered plywood, the finishes for the first, second, and third class being respectively walnut, mahogany and oak. The floors are covered in brown linoleum laid on cork felt.

One of the carriages seats 82 third class passengers and the other 8 first class, 50 second, and 19 third class. The seats are carried on stove-enamelled tubular frames and have resilient rubber upholstery covered with moquette; they are fixed, but some face one way and some the other. Certain windows are of the Widney Stuart half-drop type and the remainder are fixed. There is through communication between the two passenger carriages through the luggage compartment and along the side of the engine room, but normally this passage will be used only by the guard. The passages over the vestibules have double sliding doors and there are further sliding doors between the luggage compartment and the engine room, both of which are located on the short centre vehicle. The carriages are heated by the engine exhaust gases being passed down a duct below the centre corridor, and ribbed heaters below certain seats.

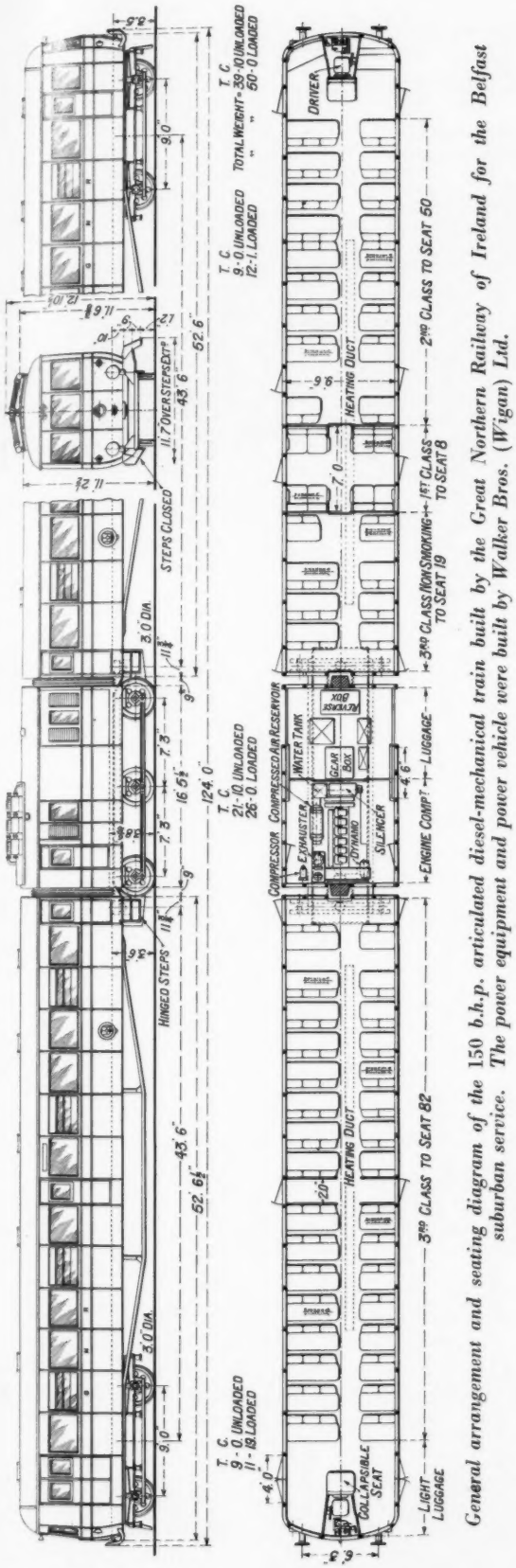
Interior of first class compartment of new diesel train in Ireland

The outer ends of the passenger carriages are supported on light bogies fitted with Hoffmann ball and roller bearing axleboxes. These bogies have swing bolsters, and an interesting point is that the laminated springs above the axleboxes have a reverse camber. The wheels are 3 ft. in diameter, and, like the wheels of the same diameter on the power frame, the tyres are turned to a taper of 1 in 40. The centre driving wheel is flangeless. Vacuum brakes operate blocks on all the wheels, but the hand-brake, applied from either driving position, actuates the blocks on the driving wheels only. As it is not the intention to haul trailers, the buffing and drawgear is merely of the emergency type.

Power Equipment

In the centre vehicle is a Gardner 6L3 type four-stroke engine developing a continuous output of 153 b.h.p. at 1,200 r.p.m. Its torque is transmitted through a Vulcan-Sinclair fluid coupling and a Wellman-Bibby flexible coupling to a four-speed Wilson epicyclic gearbox; thence the drive is taken to a reverse box and worm gear on one of the end axles of the power frame, and then distributed to the remaining wheels through coupling rods. With normal engine revs the gear steps correspond to road speeds of 9, 17, 26 and 42 m.p.h.

The engine throttle is mechanically controlled from the driver's cabs, and the gearbox and reversing gear are controlled electro-pneumatically. For the air system a small compressor of Westinghouse make is used, and is driven by Brammer belts from the engine. The air passes first to a



General arrangement and seating diagram of the 150 b.h.p. articulated diesel-mechanical train built by the Great Northern Railway of Ireland for the Belfast suburban service. The power equipment and power vehicle were built by Walker Bros. (Wigan) Ltd.

reservoir in which a pressure of 75 lb. per sq. in. is maintained. This reservoir communicates through a reducing valve with a second reservoir in which the maximum pressure is 62 lb. per sq. in. From here the air passes along a pipe leading to the various operating valves on the gearboxes. Interposed in this pipe line is a valve, the action of which ensures that unless the air pressure exceeds 50 lb. per sq. in. no air can pass. The object of this fitting is to ensure that in the case of the Wilson gearbox particularly, the requisite pressure is applied to the braking bands, thereby reducing wear on these parts to the minimum. All the air admission valves are operated by solenoids attached to the gearboxes. A spare compressor is carried for emergencies, the mounting being arranged for quick change over in the event of failure of this unit.

Gilled tube radiators are fitted on a section of the roof which is removable to enable the engine to be lifted out for major overhauls. The radiators are filled by a hand pump in the engine room, where the water tank is situated. A silencer of large size is mounted behind the engine, and at one end is fitted with a valve which diverts the exhaust gases direct to a pipe through the roof for summer working, or in winter passes it to branch pipes which have flexible connections and are continued in a duct underneath the central corridor of the passenger bodies for heating purposes. These ducts are covered by a perforated aluminium grating. The heating capacity of the pipes is augmented by ribbed radiators arranged under the seats at intervals.

A dead-man device is attached to the throttle lever, which applies the vacuum brake and closes the throttle in the event of the collapse of the driver. A spring trigger is fitted on the throttle lever to enable the driver to change gear without making a brake application, and a locking arrangement also is provided on the lever to prevent the device coming into action when the driver changes ends.

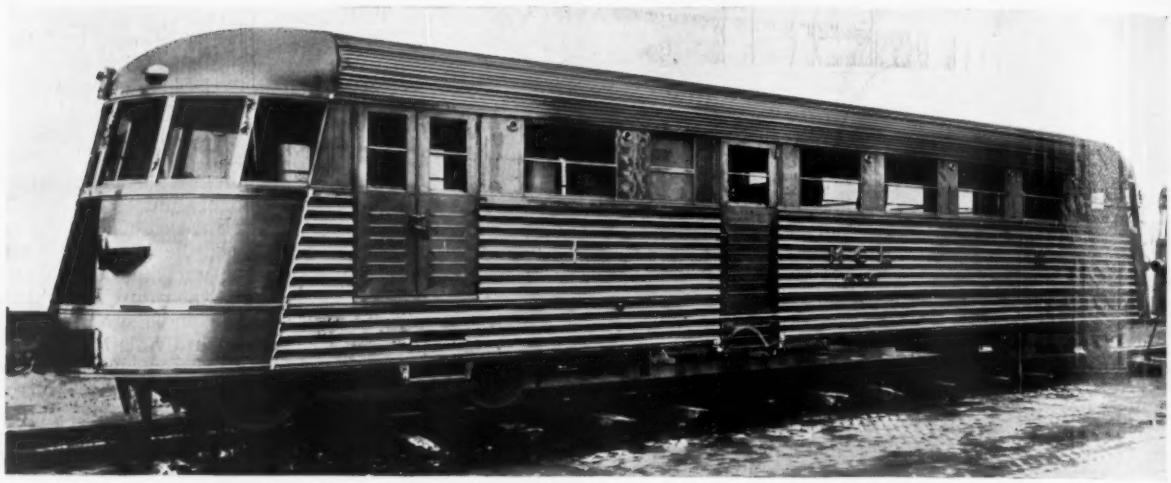
An engine self-starter button is not provided in the driver's cabs but in the engine room only, as by the use of the Vulcan-Sinclair fluid coupling it is impossible to stall the engine, and the driver is instructed to keep the car in gear until it comes to a stop at stations. Starting and lighting are electric, current being supplied by a large dynamo driven from the forward end of the engine by Brammer belts. The fuel tank of 60 gal. capacity is carried under the floor of the luggage compartment and feeds the engine by means of duplicate Amal pumps driven therefrom. A filler and dip stick are provided on the tank, access to which is obtained by removing a trap door in the floor.

The main controls, which consist of a throttle handle, gear lever and vacuum brake handle, are arranged in convenient positions. A reverse lever and hand brake complete the controls. Only one reverse lever is provided for each car, which lever cannot be moved until the gear-change lever is in the neutral position. As a further safeguard, the interlocking arrangement prevents the gear-change lever being moved from the neutral position until the reverse lever occupies either the forward or reverse position. The following fittings are mounted on the control panel: engine revolution indicator; vacuum gauge; red warning lights for engine lubricating oil pressure; dynamo charging switch; horn press button; and a red light to indicate whether the hinged entrance steps have been raised.

AUSTRALIAN DIESELS.—The Victorian Railways Commissioners have announced their intention of purchasing four oil engines to be used in vehicles for country branch lines. Tests over a period of three months had shown that the m.p.g. of a diesel car was over twice that of a petrol vehicle.

STAINLESS STEEL RAILCARS IN ITALY

Double-bogie vehicles with a top speed of 75 m.p.h.



260 b.h.p. diesel-electric railcar for the narrow gauge Calabro-Lucane line

SOME time ago the Strade Ferrate del Mediterraneo ordered more than 30 diesel railcars of three types from various Italian builders. The first of these types was the 100 b.h.p. rack-and-adhesion class described in the issue of this Supplement for July 12, 1935. The second and third types are diesel-electric cars for the 950 mm. and standard gauges respectively. The standard gauge and some of the narrow gauge vehicles are noteworthy as being the first European vehicles to be constructed of Shotwelded stainless steel on the system evolved by the E.G. Budd Manufacturing Company, of the U.S.A. Both the diesel-electric types have been built by the Soc. An. Piaggio, of Genoa, which company took out a Budd licence for Italy.

Body framing and floor of Italian stainless steel diesel railcar

The first car of the stainless steel type was exhibited at the last Milan International Samples Fair. An unusual feature of the design is that each engine-generator motor set is mounted directly on a bogie, there being two such sets to each car. The engines are of the Saurer BUD type, developing a continuous output of 130 b.h.p. at 1,500 r.p.m. in six cylinders 120 mm. bore by 170 mm. stroke; the weight is approximately 18 lb. per b.h.p. They were built in Italy under licence by the Soc. An. O.M. Fabbrica Bresciana.

Within a length of 51 ft. 3 in. the car seats eight first class and 42 third class passengers on a tare weight of 17·5 tonnes. The bogies have a wheelbase of 6 ft. 7 in. and are pitched at 33 ft. 3 in. between pivots, but the pivots are not in the centre of the wheelbase and are located only 31·5 in. from the inner axle in each case. The weight of the body complete is 5·2 tonnes, of which 2·6 tonnes is due to the stainless steel framing and panels; the weight of each bogie alone is 2·6 tonnes, and the aggregate weight of the two sets of power and transmission equipment is 7·3 tonnes. With a full complement of passengers and luggage the gross weight is about 23 tonnes, giving a ratio of 11·3 b.h.p. per tonne of weight. The electrical equipment was built by the Italian Brown Boveri Company.

COUNTY DONEGAL RAILWAY MILEAGE.—Up to the end of May the aggregate diesel car mileage run on the County Donegal Railway amounted to over 570,000 miles. The two first cars, placed in service in July and December, 1931, have covered 182,000 and 200,000 miles respectively. Car No. 12, placed in service in June, 1934, has covered 110,000 miles without a heavy overhaul, and car No. 14, set to work in February, 1935, has covered 68,000 miles.

ELECTRO-MAGNETIC TRACK BRAKES

*By L. K. SILLCOX**

THE magnetic track brake is less effective than is generally believed and its use entails features which render its application impracticable in many cases. When car equipment is light and traffic congestion serious, demanding maximum acceleration and deceleration rates, and an unlimited supply of electrical energy available, all of which are conditions common to the multiple-unit trains of important subway lines where the track brake has been most highly developed, the opportunities for justifying its cost, weight and maintenance are much more favourable than on main-line railways.

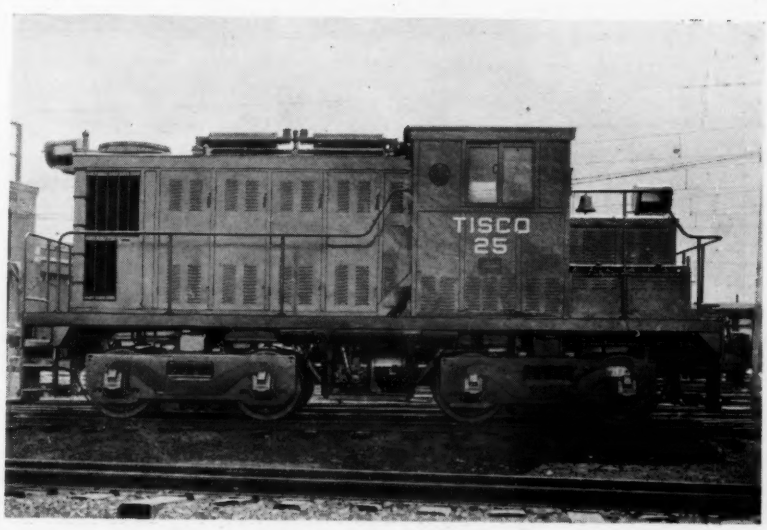
In any consideration of a magnetic track brake, several important factors must be recognised. First, to obtain an efficient track brake with predictable characteristics, perfect contact between rail and shoe must be obtained, it having been demonstrated that a 21 per cent. reduction in shoe-rail pressure results from the introduction of an air gap of but 0·0156 in. Perfect contact is impossible to maintain in railway work where both the gap and force are widely variable. Secondly, the use of a track brake makes the use of sand impracticable, since the abrasive action of a sanded rail introduces excessive wear on the shoes and, by wiping most of the sand off the rail, the shoes limit the permissible braking ratio which may be employed in connection with the wheel brake. Thirdly, it is generally impossible to instal sufficient length of track shoe, by reason of clearances between truck wheels, to provide a really effective track brake on any main-line railway equipment constructed to date. Fourthly, the cost and weight of equipment required, including battery and generator, are disproportionately high. Fifthly, there is no background of experience to define the measure of safety involved in thrusting track shoes upon the rails in front of wheels of units moving at high main-line speeds.

A typical magnetic track brake shoe will exert a pull of approximately 300 lb. per inch of shoe length on a 130-lb. rail whenever perfect contact is obtainable throughout its length. This is obtained with an energy consumption of 50 watts per inch. Although unpredictable in view of the meagre data available, it is improbable that instantaneous contact conditions will provide more than 75 per cent. of the vertical pull obtainable under conditions of perfect contact. This would mean a unit pressure of not more than 225 lb. per linear inch. If 60 in. of track shoe are installed per truck (120 in. per car or 720 in. per six-car train), the total pressure would be 162,000 lb. The coefficient of friction between track shoe and rail will probably seldom exceed a value of 0·07 throughout a stop from 90 m.p.h., in view of the very high unit pressure which may result from an equivalent magnetic attraction of 300 lb. per linear inch. It is further indicated that instantaneous values at 100 m.p.h. do not exceed 0·02. Assuming an average value of 0·07 throughout the stop from 90 m.p.h., the retarding force derived would be 11,345 lb. for the entire train. A retarding force of this order, however secured, is but 12 per cent. of that obtained by the use of a standard pneumatic brake for conventional equipment, presenting a maximum emergency braking ratio of 150 per cent., which, unassisted by an auxiliary brake, will provide an average retardation rate throughout the stop of 2 m.p.h. per sec. Were a 3·5-m.p.h. deceleration rate impressed by a pneumatic brake, electrically operated to accelerate the response of the individual valves and with a retardation rate automatically controlled, the effectiveness of the track brake would be but 7 per cent. of that of the pneumatic system. Furthermore, with an energy input of 50 watts per inch of shoe, or 6,000 watts per car, the current consumption, with a 32-volt system, will be at the rate of approximately 87 amp., requiring not less than 1,000 amp. hr. of battery capacity per car for all trains which do not derive their energy from a central source remote from the train. Adding to the weight and cost of this battery the weight and cost of the generator required to serve it in the event of the train not being electrically propelled, and that of the mechanism itself which will add not less than 600 lb. per truck, the advantage to be gained will generally be more than offset by the cost involved and the extra weight required.

* In a paper before the Engineering Institute of Canada.

A NEW INDIAN DIESEL LOCOMOTIVE

The accompanying illustration, for which we are indebted to the Editor of the Bengal-Nagpur Railway Magazine, shows one of the standard 300 b.h.p. Ingersoll-Rand diesel-electric shunting locomotives which has been acquired by the Tata Iron & Steel Company, in Bengal. These Ingersoll-Rand locomotives weigh 53½ tons and have four electric traction motors giving a starting tractive effort of 36,000 lb. The main difference from the locomotives used in America is in the gauge width, 5 ft. 6 in. against 4 ft. 8½ in.



MORE ZEPHYR RESULTS

IN an article recently published in the *Railway Age*, Mr. Ralph Budd, President of the Chicago, Burlington & Quincy Railroad, made the following comments on the performances of the company's Zephyr trains. These four units have arrived to schedule on an average of 94 per cent., as compared with the 60 per cent. arrivals on time of other passenger trains on comparable runs. By careful inspection and the regular replacement of parts liable to wear out the trains have an availability average of 97 per cent. Their immunity from accident is not so marked, for the four Zephyrs now in regular service have had nine level-crossing accidents. They have also struck, or been run into by several road vehicles and have been responsible for the loss of livestock on the track.

The *Mark Twain* was the first of the four to be involved in an accident with another train. Five minutes before reaching its destination on March 1, 1936, it collided with a rake of Pullmans at a crossover in the yards outside the St. Louis Union station. At the moment of impact the Zephyr was travelling at 20 m.p.h. One of the Pullmans and the front bogies of the *Mark Twain* were derailed, but apart from minor scratches no damage was sustained by the streamliner. Its 61 passengers escaped unscathed and it ran as usual next morning.

According to the latest data available, the operating costs for 640,942 miles up to December 31, 1935, were 31 cents per train-mile (1s. 3d. approx.). This figure includes everything except depreciation and track maintenance, and allows for accrual for power plant maintenance. It will be seen that the cost of operating such a train is well below half that of a conventional train of equal capacity at the same speeds. The following list gives actual costs for the Zephyrs and comparable steam trains:

	Zephyr trains $	Steam trains $
Maintenance of power plant or locomotive	0·0504	0·1830
Maintenance of train	0·0399	0·1020
Cost of fuel oil or coal	0·0139	0·1085
Cost of lubricating oil and water	0·0093	0·0140
Wages of crew	0·1735	0·2240
Train supplies and expenses	0·0271	0·0640
Total	$0·3141	$0·6955

With the exception of the power bogie wheels, the contour of all the wheels used on these high-speed trains has been modified so that the treads are cylindrical instead of conical. This substitution has brought about greatly improved riding comfort. The light axle loads, apart from the load on the front bogie, have given a satisfactory wheel-life, even at high speeds. The average mileage between turnings has been 58,844 miles for the 36-in. wheels of the power bogie and 56,490 miles for the 30-in. wheels of the carrying bogies.

The data given above, as abstracted from Mr. Budd's article, refer to the four Zephyr trains in service, that is, the original *Burlington Zephyr*, the *Twin Zephyrs* and the *Mark Twain*. Actually, the *Twin Zephyrs*, each making a return trip a day between Chicago and the Twin Cities, a mileage of 862, have a slightly lower cost per train-mile owing to the 50 or 60 per cent. increase in their mileage compared with the two remaining units, and to the relative freedom from trouble with which they have operated. We understand that on these trains the normal operating cost per train-mile has been about 28 cents plus 22 cents per train-mile for the dining facilities. The depreciation, interest, and tax charges amount to 10 cents per train-mile, giving a gross operating cost of 60 cents, or 2s. 6d. per train-mile. The total revenue has been about 8s. 0d. per train-mile, but of course some of the passengers attracted have come from the steam trains of the same railroad.

The World's Fastest Train

The record for the fastest start-to-stop run in the world, which has been held by diesel trains of the German State Railway since May, 1933, when the Flying Hamburger began to run in regular service, has now passed to the U.S.A. with the inauguration of a timing of 145 min. over the 202·4 miles between La Junta and Dodge City, which gives an average start-to-stop speed of 83·7 m.p.h., in the course of the run of the Super-Chief between Chicago and Los Angeles. This train is hauled by the double-unit four-engined locomotive of 3,600 b.h.p. referred to in the issues of this Supplement for October 4, 1935, February 21 and March 20, 1936. Apparently the present loading of the train is seven to nine cars weighing 500 to 650 tons. An illustration of this train arriving at Los Angeles is shown at the foot of this page.

L.M.S.R. LEYLAND CARS.—The three four-wheeled diesel hydraulic railcars supplied by Leyland Motors Ltd. to the L.M.S.R. two years ago have had their 130 b.h.p. engines replaced by others of 90 b.h.p. Two of the cars are operating on the Blackburn-Clitheroe line and the third is in the Airdrie district.

The diesel-hauled Super-Chief train on the Atchison, Topeka & Santa Fe Railroad entering Los Angeles station